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Electrical World

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November 26, 1921

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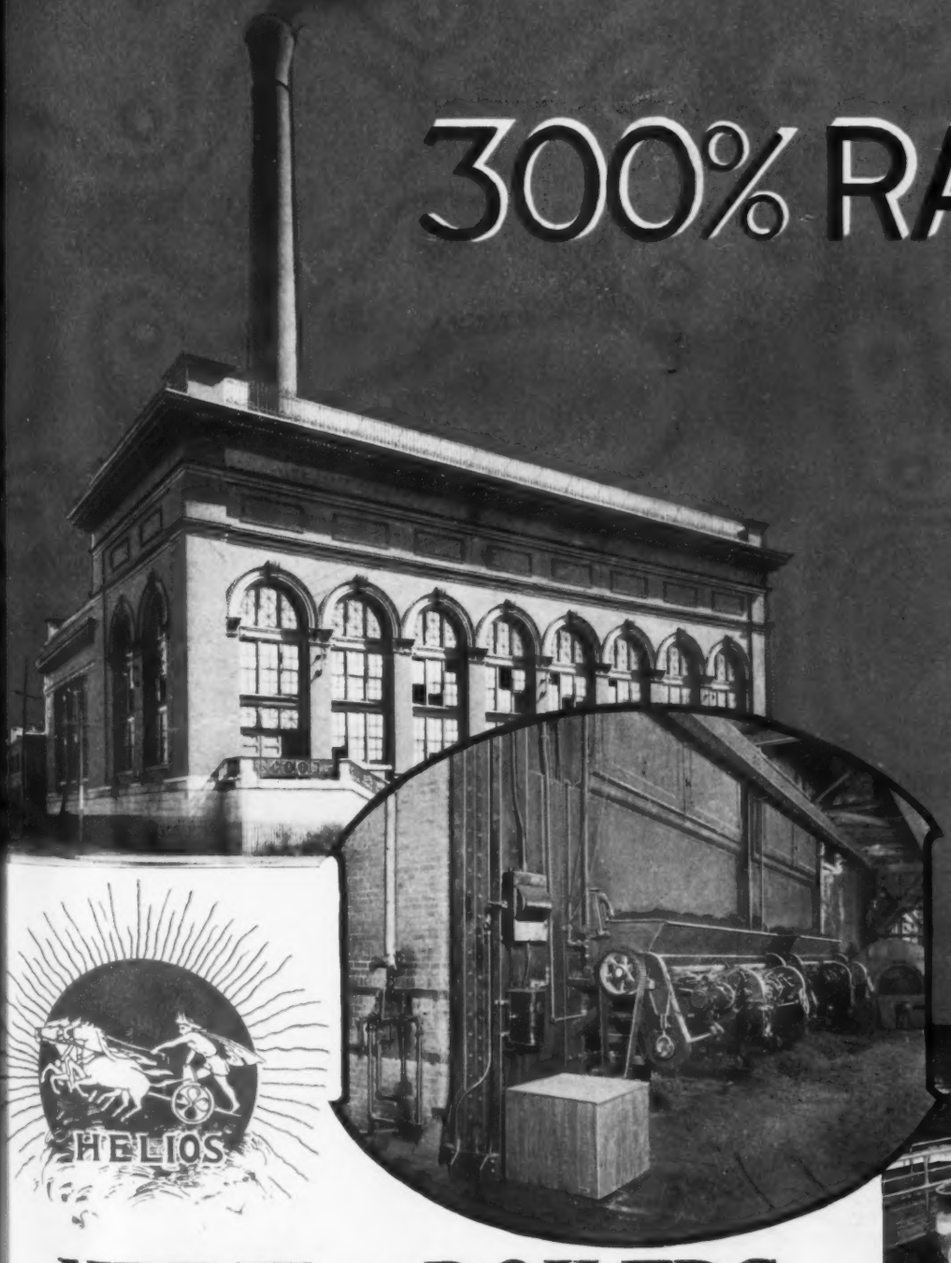

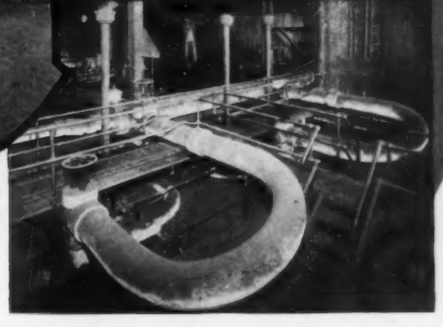

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Electrical World

New York, Saturday, November 26, 1921

Are Electrical Men in Earnest?

AN architect usually lives in a good-looking house. A man in the automobile business usually drives the kind of a car he sells. The fur man's wife usually wears a handsome coat. But the electrical man's family has almost no electrical appliances.

What is the matter with the electrical man? Is he blind or can't he see?

Manufacturers, jobbers, central-station men, contractors, dealers—all agree that electricity is a wonderful thing. They believe that the day is coming when every household will be cooking, washing, ironing, sweeping, heating, refrigerating and doing all the hard housework electrically. They know what this will mean to all the industry. But still they go on talking about selling the public and they buy nothing themselves.

Where is our vision and our sense of humor—we electrical men?

In some of the large cities there are electric shows where once a year many people look upon many appliances. In smaller cities there have been "Home Electric" demonstrations that have exhibited complete electrical equipment in a house. The people come and see and go away and wonder when such things will be in general use. They fail to appreciate that they could be enjoying these comforts right now, because they find in homes they visit only one or two or three appliances. And no one has ever heard of anybody *living* in a real electric home.

In these United States, however, there are six thousand and more central stations. In each one of them there are from a dozen to a hundred men—officials and directors, stockholders and employees—all personally interested in demonstrating to the people that electrical appliances *can* be used. *Then why don't they use them themselves?* Here are, say, 300,000 men who should be living this very day in electric homes, so that their friends will see and tell their friends, who'll tell their friends and spread the word and swell the wave of buying. And Heaven knows how many manufacturers and jobbers, contractors and dealers should have their homes equipped in the same way—and haven't. If all these men should order now all the appliances they should have bought long since to help their business—to say nothing of their families—the industry would be snowed under with rush work and profits.

Are we electrical men in earnest or are we not? If we are, then let's quit standing back and waiting for the rest of the world to use electrical appliances first. The rest of the world will naturally wait for us—unless we tire them out. We must equip ourselves. And it will pay richly to help the employee finance his purchases and even pay part of the cost to get a lot of living "Electric Homes" in each town.

Samuel Lindzey Nicholson

An executive with an analytical turn of mind who as chairman has guided the activities of the Electrical Manufacturers' Council since its organization.

AT THIS time when it is proposed to broaden the scope and increase the authority of the Electrical Manufacturers' Council, it seems fitting to speak of S. L. Nicholson, assistant to the vice-president of the Westinghouse Electric & Manufacturing Company, who has served as chairman of the Council since the day of its organization in the early part of 1916. Possessed of a keenly analytical mind and a strong desire always to get at the bottom of things, he has actively and carefully guided the activities of the Council during this initial stage of its existence. The Council, which it is now proposed shall be composed of the boards of governors of the three constituent members, the Associated Manufacturers of Electrical Supplies, the Electric Power Club and the Electrical Manufacturers' Club, has since its organization been composed of four representatives from each of these bodies and has acted as the co-ordinating body in reference to general matters affecting the relations of electrical manufacturers with other organizations. The accomplishments of the Council have been many and fundamental. They include a uniform cost accounting system, recommendations for standard catalog sizes and formation and participation in the work of the Electrical Safety Conference. Much of the work of the Council has naturally been of a more routine and of a less public nature, but has nevertheless been of considerable importance to electrical manufacturers. The co-operative work of the Council with various governmental departments has been particularly effective and has attracted much attention. The organization of the electrical manufacturers through the Council has been one of the reasons why the electrical manufacturers have in this way been able to function so conspicuously as an industry.

Mr. Nicholson was born in Philadelphia and began his electrical career in the Novelty Electric Works of that city in 1887. Shortly afterward he entered the employ of the Chadbourne-Hazelton Company, which was the sole representative of the Sprague Electric Railway & Motor Company. As this company, through a subsidiary, was engaged in the construction and often in the operation of public service companies, Mr. Nicholson has been engaged in almost every phase of this work from installing motors to managing traction properties and central stations.

Thus it will be seen Mr. Nicholson has been associated with the electrical industry almost from its very beginning as a commercial art. His name will always be linked with the development of the single reduction motor, the gearless motor and the Cutter circuit breaker. It was he who exploited this breaker for the Cutter Electric & Manufacturing Company in the early days when it was the first high-tension breaker on the market. He was also associated with the C & C Electric Company in sales work in New York. Then in 1897 he was appointed sales representative of the New York office of the Westinghouse Electric & Manufacturing Company. Here his previous experience proved of special value and within a short time he became manager of the company's newly created industrial division located in New York. Five years later he went to East Pittsburgh as manager of the company's industrial department, and in 1909 was made sales manager of the company. Then it had but a small sales force and during the seven years he was so engaged he built up the Westinghouse sales organization. In 1917 he was called into the executive department in order to give the company the benefit of his wide knowledge on matters of policy.

Mr. Nicholson was instrumental in the formation of the American Association of Electric Motor Manufacturers, now known as the Electric Power Club, was its first president, and has served on its board of governors almost continuously from the beginning. He also assisted in the formation of the American Gear Association and the Stoker Manufacturers' Association and was a charter member of the Electrical Manufacturers' Club. He is chairman of the tariff committee of the Council and represents the electrical industry on the National Industrial Conference Board. He is also a fellow of the American Institute of Electrical Engineers.

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Shall We Support Our Labor or the Japanese and German?

ABOUT $300,000,000 worth of foreign goods are coming into the United States each month. It is our experience that not less than 90 per cent of the cost of a manufactured article—from raw material to finished product—represents labor. This means that America is now sending abroad about $250,000,000 a month to employ German, French, English, Japanese and Chinese labor, while our own workers walk the streets. For German labor now earns about 65 cents a day and Japanese labor about 18 cents. We cannot employ our labor at our price and compete with these foreign workers. We cannot sell the goods we make as cheaply as the foreigner can sell his goods. And so if we would have our labor employed, we must create an artificial balance, that our products may be sold in our own market somewhere near the same price as competing importations.

There are just two ways in which this thing can possibly be done. Either our workers must lower their living standard to the level of the German and the Japanese, or the price of the imported goods must be raised by a protective tariff to a point where American industries can offer competition. There is no other alternative, and it requires no second thought to make selection. American labor must have employment, and the American worker must live according to our established standards. Therefore the protective tariff is absolutely vital to affected industries—and electrical manufacturers are particularly concerned.

Sixty Years of Service to Electrical Progress

ON BEHALF of the electrical industry of America the ELECTRICAL WORLD extends its congratulations to the *Electrician* of London on the occasion of its diamond jubilee, just celebrated. The *Electrician* is "the oldest weekly journal of electrical engineering, industry, science and finance" in the world. It has served electrical progress since November, 1861, and through the recognition of this service has won its high position, long maintained, as the leading electrical journal of the Old World.

The *Electrician* was born in the days when electricity meant to most men the telegraph and the art of electrical experiment. What changes it has been the part of this fine old journal to influence and to record! The telephone has come and established itself as an essential of modern life. The motor has come and been generally adopted for industrial and transportation purposes. Electric light has come and grown to be the universal standard of illumination. Alternating current has come and made possible the broad service of electric power to mankind. Wireless telegraphy and telephony have been discovered and the viewless air made to carry the world's messages. Electric comforts and labor-saving appliances have been devised and diversified until they are destined to be the servants of all homes in every nation. And the *Electrician* has watched and helped it all; for the influence of its progressive and constructive thinking through these many years has been a beacon to accomplishment and a guide past pitfalls.

The "Diamond Jubilee" issue of the *Electrician* reviews in a most interesting way this long record of its participation in the evolution of the electrical industry. The fortunate few in this country to whom this English paper comes will prize the issue highly as a mirror of the past. For, although American and British electrical journals may differ somewhat in matters of appearance and may have held divergent views from time to time on points of theory and practice, in purpose they have been ever single-minded to protect, promote and prosper the science, profession and business of electricity. May there be sixty more years, and then more, in which the *Electrician* shall continue its good work, which is part of a common service to the electrical men of all the world!

Water Power Development Hampered by Red Tape

WHEN in the summer of 1920 the President affixed his signature to the water-power act it was very generally supposed that all restrictions on water-power development were removed and that from then on work would be started in earnest. Indeed, so popular was this belief that applications began to pour into the offices of the Federal Power Commission, and up to date applications for over 16,000,000 hp. are on file. Not all applicants have been granted permits, however, and such work as has been undertaken has been essayed principally by existing utilities. The trouble is not with the act itself—little fault can be found with the law—but with its interpretation. Great interest therefore centers around the hearing held in Washington this week before the Federal Power Commission, at which time the National Electric Light Association, supported by the manufacturers of waterwheels, the Investment Bankers' Association and others, protested against certain of the rules and regulations as prejudicial to water-power development and inimical to the public welfare. Opposition was directed particularly against the proposed classification of accounts embodied in regulations 16 and 17. The National Association of Railway and Utilities Commissioners after several years of study by its accounting committee adopted a uniform classification of accounts for public utilities. To this classification all of the public utilities of the country subscribe. Provision is made in it for a retirement reserve which is ample to cover the requirements of steam as well as of hydro-electric properties and cer-

tainly the requirements of the water-power act making it obligatory on licensees to maintain adequate reserves. This classification of accounts which prevails throughout the country, however, differs greatly from that proposed by the Federal Power Commission, and objection is made to the latter because it involves keeping two separate systems of accounts, which is an unnecessary waste. However, that is trifling compared with the chief objection to the proposed system of accounts, which is that it imposes a hardship upon public utilities and hampers their proper and adequate financing. To companies operating in a virgin field the regulations are particularly onerous, and few if any could operate under them. The experience of manufacturers and operators was singularly convincing on this point. The shops of the former are idle, while the latter cannot raise the money with which to make the developments. We have therefore reached an impasse, and unless some change is made water-power development will come to a standstill. The utilities cannot serve two masters. They are operating under state regulation and are content to do so. They are therefore already publicly controlled, and there is force in their argument that this should suffice. The general understanding of the Congress which passed the enabling legislation was that the Federal Power Commission would be a supervisory and not a regulatory body. On that account any attempt toward bureaucracy cannot be too quickly killed in the public interest. It simply adds needlessly to expense, which must be reflected in increased rates, and discourages development, and that is not what the act was designed to do.

Unanimity of Opinion on Mitigation of Electrolysis

MITIGATION of electrolytic corrosion of underground structures has been attempted in this country by devoting greater attention to track bonding, by "draining" of neighboring pipes and cables, and more recently by the use of insulating joints. Notwithstanding the use of these preventive measures, the trouble from electrolysis is becoming increasingly important by reason of the rapid increase in traffic on electric railways. Therefore, in view of the difficulties which most companies have experienced in investigating and combating this trouble, they should receive the report of the American Committee on Electrolysis with a great deal of gratitude. Besides being a comprehensive treatise on the subject, the report should be particularly valuable because it represents unanimity of opinion on the part of nine important national engineering organizations.

The committee emphasizes the necessity of a practical means for measuring current density across contact surfaces of pipes and earth and for the determination of polarity of structures and adjacent earth. Fortunately, this need has been answered to a large extent by the recent work of the Bureau of Standards, which has developed an instrument that will, it claims, measure the mean current density in a sphere of soil as small as 3 in. or 4 in. in diameter. This qualification is particularly important since it makes it possible to select the point of observation close to the underground structure being investigated. The necessary measurements may be made by driving a small pipe into the earth, removing it and inserting in the hole a rod carrying the requisite electrodes. However, it should be remembered that the dangerous corrosion usually takes place over very small surface areas of pipes. Consequently, even though the instrument mentioned represents a long step in advance, it does not yet permit actually getting to the vital part on the surface of the pipe. A further development of the method, as promised by the Bureau of Standards, will be awaited with interest.

Electric Service and Farm Productiveness

THE National Electric Light Association has started this year a committee on rural line extensions which will take up a pressing and much-needed work. It is not generally appreciated that one of the biggest problems facing the farmer is that of substituting mechanical power for the labor, both human and animal, that has been the mainstay of the farm. The gas and steam engines have already played a large part in transportation, and the tractor is rapidly assuming a larger share in the same work. The farmer is in the same position with reference to the use of electricity that the manufacturer was in twenty years ago. It represents a means of pulling him out of some of the economic difficulties he is facing and enabling him to employ labor-saving devices to a degree comparable with other industries.

Not only must methods of providing the supply of electricity be developed, but the farmer must be educated in its use and equipment for his purposes must be developed. Not the least important factor is the possibility of improvement in the farm-home problem. Few women are so greatly overworked as the farmer's wife without help. She must cook, wash, sweep and busy herself about the house and farm from early morning till night. In fact, hers is largely a life of drudgery, and on her strength and ability to care for and feed the farmhands depends to a large measure the size of the farm. Obviously, electricity can do much in easing her household burdens and making farm life more attractive to her and to her children, and few there are who appreciate its advantages more. The question of farm productivity does not always depend on getting farm hands, but on the ability of the farmer's wife to care for them, and in studying the whole question of rural line extensions the National Electric Light Association is doing a truly national service of immense social and economic value.

The Illumination of Metal-Working Plants

METAL working is a broad term covering all sorts of shop work from the coarsest stamping and roughing out to the finest lathe work. There is, however, a certain consistency about it in that on the average the body of the work is dark while surfaces exposed to tooling may be astonishingly light, presenting therefore the double requirement of very good illumination on the work and the minimum possible glare. A. L. Powell's notes on the proper method of lighting such plants to increase production, published elsewhere in this issue of the ELECTRICAL WORLD, are very much to the point in showing the kind of thing which has to be done. Whatever the exact lighting equipment, Mr. Powell's advice that the walls and ceilings should be of light color is thoroughly sound. In these days of general use of electric drive and appreciation of cleanli-

ness in shops, some illuminating value from paint and whitewash may fairly be counted on. There are various classes of metal working demanding a wide range of intensities of illumination. Mr. Powell's specifications for good practice run from 4 foot-candles up to 12 foot-candles, according to the nature of the work. The variations which have proved actually to be desirable are probably even greater than this.

A factor often neglected in dealing with requirements for illumination is the effect of automatic and semi-automatic operations of various sorts. In running certain machines the operator is simply going through a series of regular movements requiring under ordinary circumstances very little ocular attention. The work may not be necessarily such as would be classified as rough, but it makes no demands on keenness of vision. Some operations of this type require no more light than the very coarsest kind of machine work. Others, at first glance not dissimilar, differ in that while the operations are nine-tenths of the time semi-automatic, the variations from this orderly procedure require very keen vision. In such cases the illumination has to be pushed up considerably beyond the point which would otherwise seem necessary. Then, too, while the speed of recognition of detail increases materially with added illumination, there are a good many operations in which the speed is fixed entirely by other considerations.

These points are mentioned merely to show how far the illumination of shops still is from a state for which a prescription can be written out. One phase of this matter Mr. Powell emphasizes, namely, the desirability of departing from so-called general illumination, not in decreasing the total amount of light to be furnished but in changing its distribution so that it will do the greatest possible good in lighting specific machines. This is really nothing more than recognition of the almost self-evident fact that on few manufacturing floors is there a wholly uniform and orderly disposition of the machines with relation to the outlets more or less thoughtfully provided by the architect. The weakest point in general factory illumination is the fact that the wiring is too often planned without the slightest reference to the installation which must through it be provided with light.

A Triumph for Long-Distance Oratory

PRESIDENT HARDING'S address at Arlington on Armistice Day was transmitted to New York and San Francisco and was heard by an audience estimated in the aggregate at 150,000 persons. This telephonic triumph emphasizes again the important achievements of recent research in that field. Considered from the standpoint of engineering, the feature demanding perhaps greatest admiration was the maintenance of the purity of the speaker's voice throughout the whole range of transmission. Virtually every step in the long sequence of equipment presented danger of distortion of the complicated current waves corresponding to a speaker's voice, but the demonstration showed that at each one of these danger points study and development have succeeded in transmitting the current wave almost undisturbed.

Long-distance oratory has appealed to the imagination ever since its first announcement several years ago and has excited further admiration with its perfection. However, it must be remembered that speech so transmitted to long distances and delivered broadcast in increased volume to large audiences is still subject to the imperfections attendant upon everyday telephonic transmission and which are imposed by the limitations of the transmitter and receiver as we have them today.

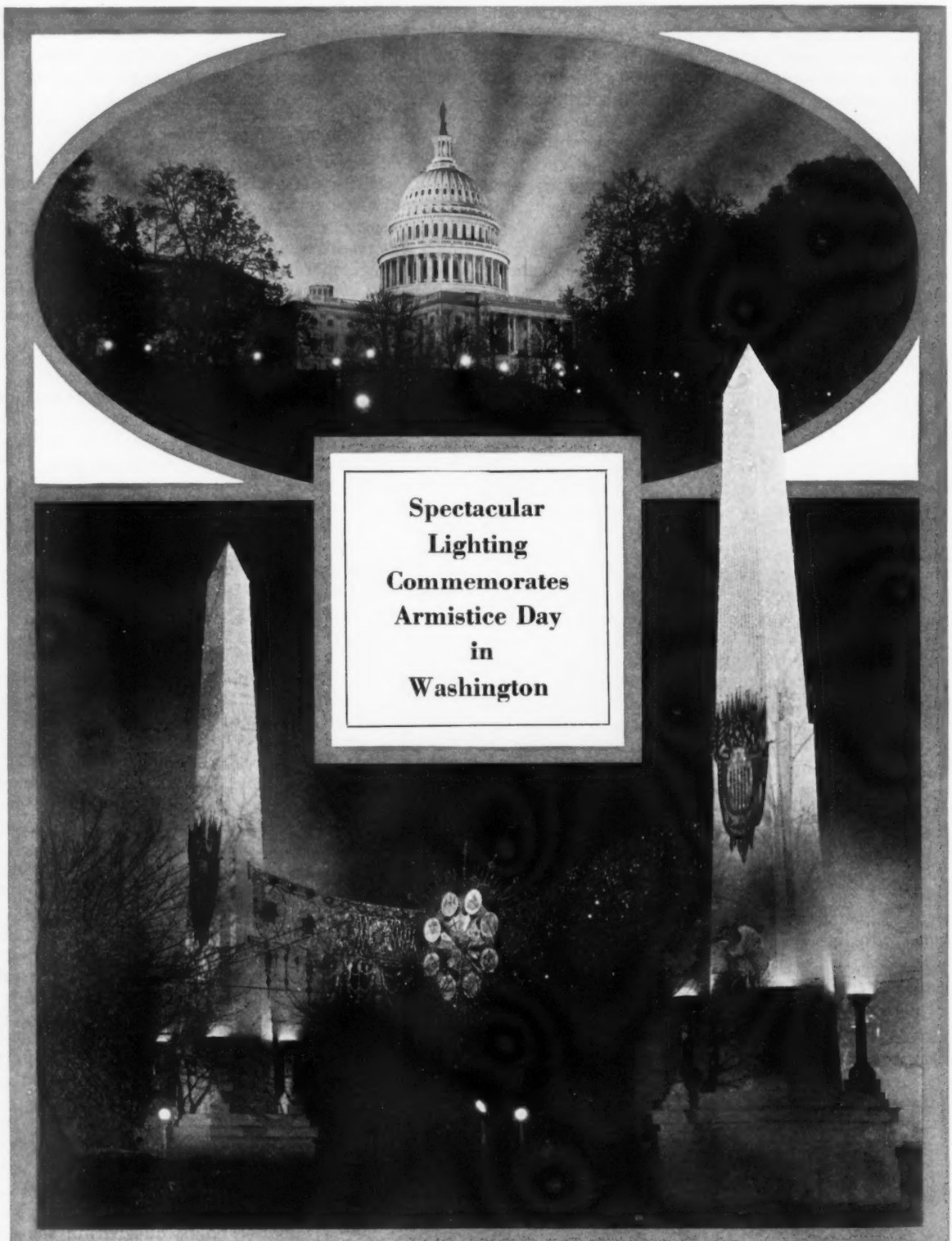
Design of 220,000-Volt Power Transformers

IN THE frequent discussion during the past few years of superpower systems and higher voltage transmission in general, manufacturers' engineers have invariably expressed confidence that the necessary transformers would be forthcoming when needed and would possess the certain reliability indispensable to so vital an element in the complete system. Some of the grounds for this confidence have been revealed recently in the published accounts of several noteworthy instances of transformer construction. The completion and successful operation of transformers for 1,000,000 volts, even though for testing purposes only, would seem to indicate that the problem of insulation is well in hand. Even greater interest perhaps attaches to the 220-kv. power transformers.

Details of design are now becoming available and we present in this issue an account by Walter M. Dann of the principal features of design of six 16,667-kva., 220,000-volt transformers for the Fall River transmission of the Pacific Gas & Electric Company. The article indicates forcibly the dependence of the design of this last word in the manufacturer's art on years of observation of transformer performance and the most careful study of and attention to every detail of assembly. For the transformer remains in its essential elements the same simple device which first appeared some thirty-five years ago. Its principle permits no radical improvement. Its growth, its increasing ability to meet all demands, has been solely due to a better understanding of its limitations in performance and a steady betterment in the materials entering into its construction.

The new designs are characterized by several new tendencies in further precaution against insulation and temperature troubles. The coil construction and assembly are such as to place the high-tension end of the winding as far as possible from the body of the core. The permanent grounding of the neutral of the high-tension Y-connection aids materially in enhancing this feature. Moreover, there is a more rational distribution of insulating material throughout the windings than ever before. Part of the low-tension winding, for example, is bare, and the insulation per turn varies in individual high-tension coils.

Perhaps the most striking features are those bearing on the dissipation of the losses and the maintenance of uniform temperature. The usual vertical ducts and the spaces between coils and coils and iron are increased in number and size, and now in addition the core itself is in two parts, one within the other, with liberal space between for coil circulation. The impression given is that the transformer is gradually assuming a cagelike form with all solid parts honeycombed in every direction, in sharp contrast with the early idea of a compact solid mass in which coils and iron were brought into closest relation in the interests of economy of material. In the race for reliability electrical performance has not been forgotten. A full-load efficiency better than 99 per cent is announced, with other interesting figures.



Spectacular Lighting Commemorates Armistice Day in Washington

ELECTRICITY, the ever-ready servant on all occasions, made possible at Washington on Armistice Day one of the most elaborately executed lighting displays since the Panama-Pacific Exposition. Searchlights and floodlights totaling 4,950,000,000 beam-candlepower bathed Washington Monument and public buildings, including the Capitol and the White House, in illuminating splendor. The display culminated in an illuminated archway, an avenue of light leading to the Pan-American Building and an "aurora borealis" back of the Capitol. W. D'A. Ryan, director of the illuminating laboratory, General Electric Company, planned the effects.

Features of 220,000-Volt Transformers Available for First Time

Rated at 16,667 Kva. Each, the Pacific Gas & Electric Transformers Constitute the Largest 220,000-Volt Units Built to Date — Unusual Coil Arrangements, Insulation and Departure in Ventilation Make Them of Particular Interest

By WALTER M. DANN
Engineer Westinghouse Electric & Manufacturing Company

UNDOUBTEDLY one of the first 220,000-volt lines to be put in operation will be that of the Pacific Gas & Electric Company from its Fall River No. 1 generating station on the Pit River to the San Francisco Bay District, about 250 miles (400 km.) distant. At the start the development will have an output of 70,000 kva., but ultimately its generating capacity will be in the neighborhood of 450,000 kva. While the lines will in the first instance be operated at 175,000 volts, they will be energized for 220,000 volts in the near future. The transformers which will step up the voltage from the 11,000-volt generators are particularly interesting because of the unusual coil arrangement provided, the insulation of both the low-tension and high-tension windings, and the departure in ventilating practice. These and other features will be described in the following article, which also contains results of tests of important characteristics. The transformers are the logical successors of the 16,667-kva., single-phase experimental transformer for 220,000-volt service that had previously been designed, built and tested at the manufacturer's plant. Extensive tests made on these transformers proved what had been anticipated, namely, that there were no reasons why units of such size and for such a high operating voltage could not be built as successfully as for much lower voltages.

Two 50,000-kva. banks of transformers will be installed in the Fall River station, each bank to consist of three single-phase, oil-insulated, 16,667-kva. transformers, which are cooled by water circulating through internal cooling coils. The high-tension windings are connected in star and the low-tension in delta, the high-tension windings being arranged so that they may be operated at 110, 125, 175 or 220 kv.

Since the 220,000-volt transmission line is to be operated with its neutral point directly grounded at both ends of the line, the voltage stresses in the transformers will be greatly reduced, and the insulation can be tapered from the high-voltage line end to the neutral point. Although the usual test voltage applied to transformer windings is twice the operating voltage plus 1,000 volts, experience with transformers operated on three-phase lines with the neutral point directly grounded has proved that the operation in service is successful if the test applied is based upon the actual voltages to ground which are developed in the windings. The Fall River transformers have been designed on this basis and the high-voltage windings have received a one-minute test of 350,000 volts, which is induced in the winding by applying 30,000 volts at a suitable frequency to the low-voltage winding. This is the most searching kind of a test that can be applied to a transformer.

Owing to the grounding of the neutral point it has been possible to arrange the coils in a very unusual way, quite different from the ordinary core-type winding, but similar to the arrangement used by the West-

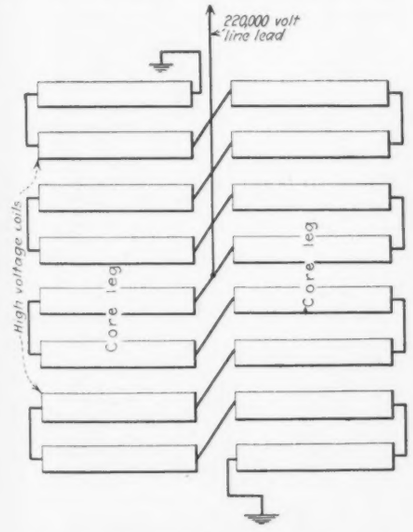


FIG. 1—SCHEMATIC DIAGRAM OF INTERCONNECTIONS BETWEEN HIGH-VOLTAGE COILS

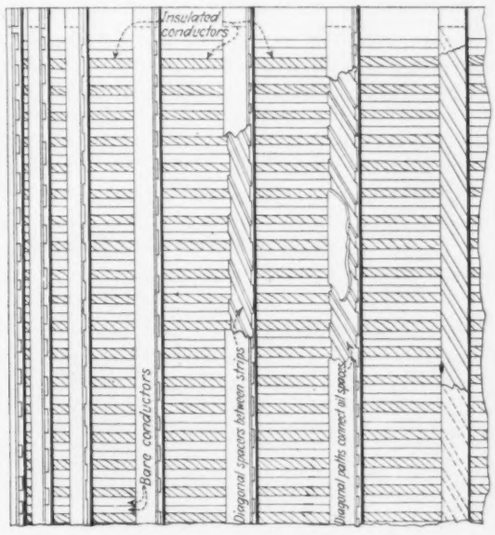


FIG. 2—VENTILATED SPACING STRIPS USED TO SEPARATE LOW-VOLTAGE COILS FROM ADJACENT INSULATION

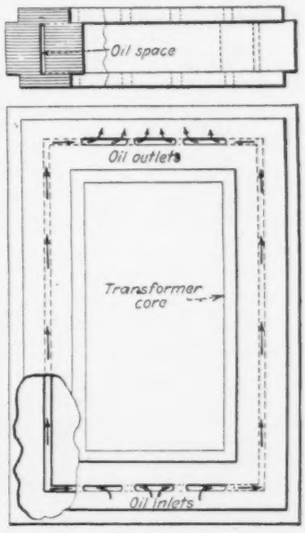


FIG. 3 — THE CORE IS CONSTRUCTED SO THAT OIL WILL CIRCULATE THROUGH IT

inghouse company for the past ten years in high-voltage testing transformers of the core-type. The high-voltage coils of the transformer are divided into two circuits connected in parallel, one made up of the coils in the top half of the transformer and the other of the coils in the bottom half. The 220,000-volt line terminal is connected to a coil near the middle of the stack in each leg, and the coils in each half are connected in series back and forth between the stacks, as indicated in an accompanying illustration. Since the other end of the winding is grounded, the coils next to the top and bottom yokes are practically at ground potential. This arrangement makes the difference of potential between any coil of one stack and the adjacent coil on the other stack equal to the voltage of only two coils. For this reason very little separation is required between the two stacks of coils, and virtually no insulation is necessary between the yokes and the high-voltage coils at the top and bottom of the transformers. Because of these features it has been possible to make the transformers relatively small and compact compared with what would be expected in transformers designed to operate at the voltage for which these are intended.

The high-voltage winding is composed of 132 pancake coils, sixty-six in each stack, placed concentrically over cylindrical low-voltage windings. For the high-voltage coils use is made of rectangular copper strap inclosed in a sleeve made up of a number of paper and treated cloth strips formed continuously over the conductor as the coil is wound. The sleeve, which has a very high dielectric strength in itself, is supplemented by insulating material placed between the sleeved conductors. This spacing of solid insulation between conductors tapers from a very substantial amount at the high voltage end turns to a smaller amount in the body of the winding and is again gradually increased to a considerable amount at the grounded end of the winding. Between adjacent high-voltage coils are spacers which form ducts for circulation of oil past the face of coils.

During the drying and impregnating process, and until the coils are finally assembled on the core, the stacks of coils are clamped between heavy rings by means of bolts. After assembling, the temporary bolts are removed and the permanent clamping from the end frames holds the coils in place. This practice prevents the swelling of the coils due to absorption of moisture and assures the correct dimensions of the stack when finally mounted.

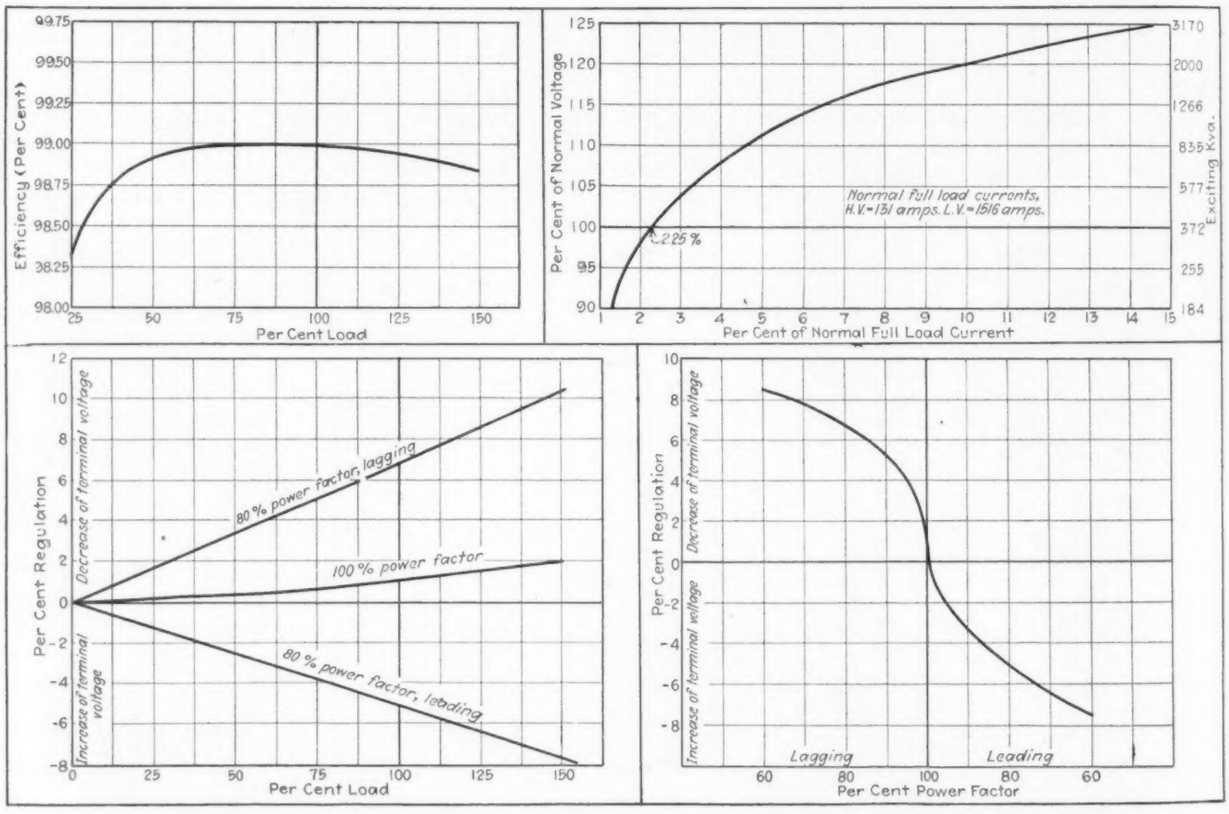

Efficiency (Per Cent)
99.75
99.50
99.25
99.00
98.75
98.50
98.25
98.00
25 50 75 100 125 150
Per Cent Load
Per Cent of Normal Voltage
125 120 115 110 105 100 95 90
Normal Full load currents, H.V.=131 amps. L.V.=1516 amps.
2.25 %
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Per Cent of Normal Full Load Current
Exciting Kva.
3170 2000 1266 835 577 372 255 184
Per Cent Regulation
Decrease of terminal voltage
Increase of terminal voltage
80 % power factor, lagging
100 % power factor
80 % power factor, leading
12 10 8 6 4 2 0 -2 -4 -6 -8
0 25 50 75 100 125 150
Per Cent Load
Per Cent Regulation
Decrease of terminal voltage
Increase of terminal voltage
10 8 6 4 2 0 -2 -4 -6 -8
Lagging
Leading
60 80 100 80 60
Per Cent Power Factor

FIG. 4—TOP, LEFT, EFFICIENCIES OBTAINED AT VARIOUS LOADS. TOP, RIGHT, EXCITING CURRENT AND KILOWATT-AMPERES AT VARIOUS IMPRESSED VOLTAGES. BOTTOM, LEFT, REGULATION OF TRANSFORMER AT DIFFERENT LOADS AND POWER FACTORS. BOTTOM, RIGHT, REGULATION WITH NORMAL FULL-LOAD CURRENT AT DIFFERENT POWER FACTORS

The low-voltage coils also have novel features not found in most core-type windings. The windings, which are cylindrical, are placed on micarta tubes, one placed on each leg of the core next to the core. The winding consists of three copper straps in parallel, one outside conductor being insulated and the two remaining conductors bare, so the covering of the single conductor plus an insulating strip forms the insulation between turns.

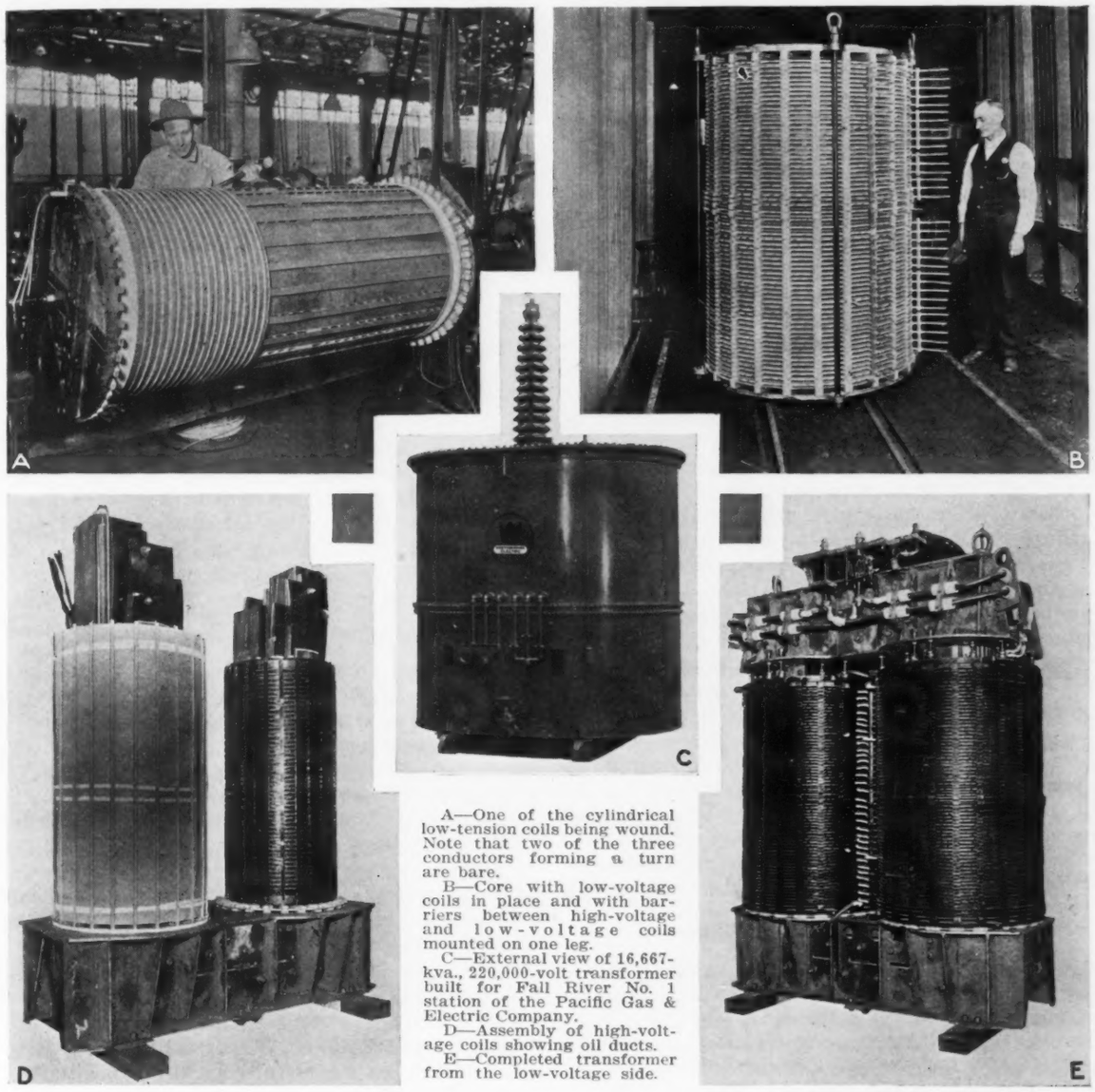
Another feature of the low-voltage winding is the ventilated spacing strip used to maintain separation between the winding and the micarta tube on which it is wound and, in addition, to afford a path through which oil may circulate past the conductors of the coil. Although solid spacing strips have been used heretofore almost universally for this purpose, the spacers in these transformers are made of molded material set at an

angle between two thin inclosing strips. Being set on a bias, the internal spacers afford firm support to every conductor and at the same time provide ducts through which a free interchange of oil can take place between adjacent ducts.

The bare conductors of the low-voltage coils and the ventilated spacing strips are both important factors in producing the uniform temperatures and freedom from short-circuit forces which would otherwise tend to cause vertical movement of the coils.

Only one high-voltage bushing is required per transformer to carry the line lead through the cover. The other end of the winding is grounded permanently to a stud in the cover, and a terminal is provided to which an external ground connection can be made. The well-known condenser-type bushing is employed. It is an

Coil Arrangement, Insulation and Ventilation Are Features of This 16,667-Kva., 220,000-Volt Transformer



A—One of the cylindrical low-tension coils being wound. Note that two of the three conductors forming a turn are bare.

B—Core with low-voltage coils in place and with barriers between high-voltage and low-voltage coils mounted on one leg.

C—External view of 16,667-kva., 220,000-volt transformer built for Fall River No. 1 station of the Pacific Gas & Electric Company.

D—Assembly of high-voltage coils showing oil ducts.

E—Completed transformer from the low-voltage side.

hot spots which the tests of these transformers disclosed.

Between the high-voltage and low-voltage windings are tubes of insulating material interspersed with oil ducts. The coil stacks rest directly upon the end frames of the transformers, great care having been taken in the assembly of the coils to make the heights of the high-voltage and low-voltage columns exactly the same so as to eliminate any differences in the magnetic centers of the coils. In this way it is expected to minimize the extension of the standard line of condenser bushings which has been made for interchangeable use on transformers, circuit breakers and lightning arresters. The lead from the transformer windings can be fished through the bushing after it is mounted in place, making its installation an easy matter.

The bushings have received a test of 375,000 volts at 60 cycles for one minute under rain conditions, *i.e.*, with 0.1 in. (2.5 mm.) of water per minute directed

toward the bushing at an angle of 45 deg. It would require in the neighborhood of 525,000 volts to produce a flashover under these conditions.

The magnetic circuit of a large core-type transformer requires more than ordinary attention in the design if troubles of various kinds are to be avoided, since it represents a considerable bulk of material with a relatively small radiating surface. If no special attention were given to the ventilation of such a core, the result would be high temperatures at the innermost parts of the core, a gradual breaking down of the insulation between laminations and finally fusing of the iron. This train of events would spread over quite a period of time, not becoming evident perhaps for months, but in the final stages of deterioration would move swiftly to a failure of the transformer which would be more or less complete.

For the foregoing reason a departure has been made from the ordinary practice of ventilating the core of a core-type transformer by making the inner part of the iron circuit virtually of two separate cores, one set within the other, with a space 1 in. (2.5 cm.) wide formed between the two parts and extending completely around the length of the magnetic circuit. Slots are punched in the yokes at the top and bottom of the core to form a passageway into the internal duct. By this construction an internal circulation of oil is set up along the yokes and vertically through the legs of the core. The advantage of this construction is shown by tests made with thermocouples well distributed throughout the core during a heat run. The thermocouples showed that the internal temperatures were uniformly moderate and that there were no hot spots.

In order to make the coils fit properly over the core and relieve them from unnecessary mechanical strain, the cores are accurately aligned and held rigid by angles and stiffening strips. The bolts which clamp the laminations together are attached to heavy insulating tubes of micarta and are well insulated at the ends to prevent contact with the core. Additional insurance against misalignment of the laminations and unnecessary air gaps was provided by assembling the laminations on cradles and using temporary pins in place of the permanent bolts with their insulating tubes in place. The temporary pins eliminated the wear and tear to which the insulating tubes would have been subjected if the core had been built up around them. The laminations were held in the cradle until they are raised into a vertical position in order to avoid abnormal strains.

Measuring the Temperature

Until quite recently it has always been the practice to use the temperature of the hottest oil in a transformer tank as an index of the operating temperature of the winding, but this sort of measurement gives a very incomplete idea of the proper temperature. Instead of employing this method in the Fall River transformers, temperature measurements are made on a small auxiliary coil which is heated by current proportional to the load current and subjected to the same radiating conditions as the main windings. The bulb of a thermometer is embedded in this coil, which is mounted inside the transformer case. The bulb temperatures which correspond at all loads to the temperature of the hottest parts of the main winding are read directly on a dial attached to the outside of the transformer case. By observing the indicator the operator is enabled to load the unit intelligently and to avoid dangerous temperatures.

For cooling the transformer copper-tube cooling coils placed in the upper part of the transformer case are used. The coil is made of three equal lengths of tubing in parallel in order to reduce the pressure required to circulate the water. Since the transformers are to be operated out of doors, the inlets and outlets of the cooling coils are brought through the walls of the tank at a point below the lowest level of the coils in order that the water may be drained if the transformer is to stand idle in cold weather. It may be interesting to know that almost a half mile of tubing is required in the complete cooling coil.

Since the over-all dimensions of the tanks for these transformers were large enough to prevent shipping them from Pittsburgh to their destination in one piece, it was necessary to build them in two parts with a joint around their girth. When the tanks were received at their destination the two parts were assembled, riveted together and calked. The core and coils complete weigh 29 tons—the case weighs 17 tons, and the transformer complete with oil weighs 79 tons. The floor space required is 11 ft. 9 in. x 14 ft. 5 in. (3.5 m. x 4.3 m.).

Performance of Units

Results of some of the tests conducted on the completed transformers in the works of the Westinghouse Electric & Manufacturing Company at East Pittsburgh are shown in accompanying curves. In comparison with most electrical and mechanical machines the efficiency obtained is remarkable, especially in view of the extremely high voltage for which they were insulated. The losses at full load are a trifle less than 1 per cent of the rated output, giving an efficiency under standard A. I. E. E. conditions of slightly more than 99 per cent. On account of the care used in designing and building the core, the iron loss amounts to only four-tenths of 1 per cent of the output. Measurements also showed very low exciting-current characteristics. At normal voltage and frequency the exciting current is only 2.25 per cent of the normal full-load current. For impressed voltages as high as 120 per cent of normal it remains within 10 per cent of the full load current. The regulation characteristics under various conditions of load and power factor are shown in an accompanying curve. The impedance voltage at normal frequency and with full-load currents in the windings amounts to 10 per cent of the normal voltage.

Two of the transformers were tested before shipment under full load and normal excitation for a period long enough to obtain steady temperature conditions. Measurements by thermometer and by the resistance method showed that temperature rises were within the guarantee of 55 deg. C. The insulation tests described previously were successfully applied while the transformers were hot.

Wisconsin Taxes Municipal Plant

FOR the first time in the history of Wisconsin the tax commissioners of that state are to levy an impost on a municipal utility, the electric plant of Stoughton having made itself amenable to state taxation by extending its service outside the city. Stoughton will be forced to apply to the Public Service Commission for permission to increase its rates to meet the tax.

Selling Utility Securities in Alabama

Recent Experience in Restoring the Old-Time Method of Financing Public Service Corporations by the Sale of Junior Securities Widely Distributed Among the Consumers and the Local Public

By F. D. MAHONEY
Manager Alabama Power Company, Birmingham, Ala.

THE electric light and power company executive of today—contemplating his efficient generating stations, adequate transmission and distribution systems and his corps of trained men—no doubt has a feeling akin to pity for his predecessor of the early nineties. And it is true that the present-day central station compares with its prototype of the period referred to as the modern machine gun compares with the flint-lock musket of bygone days. However strange it may seem, these ultra-modern central-station companies are reverting without hesitation to the ancient but disregarded policy of customer ownership of securities, which was so largely responsible for the upbuilding of our great industry.

The majority of the pioneer lighting and power plants were promoted and financed by progressive citizens of the communities in which they were built. A keen personal interest in the utility as a home institution pervaded the public mind, and inadequate and costly service was overlooked. A spirit of co-operation between utility officials and the general public usually existed in the same degree as that in which securities were held in the districts served, and harmony was the watchword of progress.

THE BACKGROUND OF CUSTOMER OWNERSHIP

As the cities increased in size and population more capital was needed for development of the utilities, and the financial requirements rapidly exceeded the resources of local banking institutions. The expanding properties called for more and more capital for plants and extensions, and as time went on the financial control of the majority of utilities gradually passed to the great banking interests in centers usually remote from the home district of the utility concerned. In the interest of economy in operation and stability of earnings through consolidation, many syndicates and holding companies were formed, and thus the physical as well as the financial control of the utilities passed from local to foreign interests.

Of course, nothing so interwoven with civic life as the utility supplying the public with transportation, light, heat and power could hope to escape the attention of the political element, and as a football between the parties in power and the aspirants for office the average utility was misrepresented until it was generally placed in an unenviable position before the public and the hue and cry against "absentee landlordism" echoed throughout the land.

So even before the world war, to counteract all this, certain central-station companies—fortunate in having far-sighted leaders—experimented with the idea of selling junior securities in small lots and at especially attractive prices to employees and customers.

The advent of the high-price era during and following the late war changed this policy from one of public relations promotion to one of grim necessity. Material and equipment prices soared beyond reason, and to accentuate further the difficulties of the operators the cost of obtaining money kept pace with the rising cost of other materials and commodities. In order to dispose of public utility securities in large blocks it became necessary to sell them at a sacrifice to make them yield the high rate of interest demanded by inventors. Even with a high yield, the precarious condition of the majority of the utilities, their inability in many instances to pay bond interest, and in some cases even failure to earn operating expenses, made investment in public utility securities an unattractive one for investors who were readily attracted to industrial and more speculative securities bearing higher interest rates.

It was then that the urgent requirements for new capital drove home the fact that a fertile field for the sale of junior securities in small blocks existed at home, and a trial of the plan invariably convinced its sponsors that it was not only feasible but would probably prove the salvation of many companies that were unable otherwise to obtain sufficient money to carry on the mandatory extensions to their facilities brought about by the general prosperity in industry. The success of the plan was immediate and opened a field that is seemingly inexhaustible, possessing as it does the twofold advantage of obtaining money at reasonable rates and at the same time laying the foundation of a firm friendship for and an active interest in the company on the part of every person buying its securities. The latter result is an asset of greatest value under the present system of state regulation of public utilities. The regulating authorities are keenly alive to the manifold advantages of customer ownership, and many state commissions have gone on record as favoring this policy.

PREPARING FOR THE CAMPAIGN

The Alabama Power Company was one of the pioneers in this movement in the South. In the early part of June, 1920, a sales campaign was launched to dispose of 10,000 shares of $100 each, par value, 7 per cent cumulative preferred stock, to be sold at 93 plus accrued interest, to yield 7.53 per cent. The potential sales force consisted of the 1,200 employees of the company, directed by an investment department, consisting of a department manager and a "clean-up squad" of two or three men. Before placing this stock on the market a careful study was made of the methods and practices employed with success by other companies, and a sales policy was outlined incorporating those features deemed most applicable to our territory and situation. Attractive literature descriptive of the physical property and the financial condition of the company was prepared and an intensive advertising campaign waged in the daily

and weekly papers of the state. Bulletin boards were erected at convenient points on the system, and instructive and inspiring bulletins were published frequently.

The campaign was formally opened at a mass meeting of employees at headquarters, followed by similar meetings at each operating center. Inspirational and instructive talks on methods of selling stock and the urgent necessity therefor were delivered by executives and directors of the company, and each employee was requested to make stock selling a part of his daily work. As an inducement to investment by wage earners and people of limited means a partial-payment plan was devised whereby a small initial payment could be made on each share and the balance paid in seventeen equal installments. Interest on partial payments was allowed and the privilege of withdrawal at any time was extended.

As an incentive to placing the stock commissions were offered to all employees on the basis of $2 for the first share sold on time payments and 50 cents for each additional share. Three dollars was offered for the first share sold for cash and 50 cents for each additional share. The commission on cash sales is paid promptly, but on the time payment sales $1 of the commission due is paid immediately and the balance when $40 on each share is paid to the company. To further stimulate sales cash prizes were offered to employees and to departments selling the greatest number of shares each week.

ACTUAL RESULTS IN SALES

The campaign was a success from the start. The sales of stock mounted steadily until in the early part of 1921 the total issue of 10,000 shares had been subscribed. Of this issue our employees had purchased or subscribed for 1,500 shares, or 15 per cent of the total offering. It is interesting to note that approximately 50 per cent of the shares sold were disposed of for cash and the balance on the time-payment plan.

So successful was the first attempt at security sales locally that stock selling now has become an important part of our daily operation routine. To assist in financing our second large hydro-electric development on the Coosa River, we expect to raise several millions of dollars by sales of preferred stock to our customers and to our employees, and this offering is now being absorbed as fast as can be expected under the economic conditions prevailing in our section.

The present issue differs from the original only in the fact that the shares are without nominal or par value, instead of being $100 par value as before. Contrary to the general idea, this fact has been no deterrent to the sale of this security, and our experience shows that the small investor is more concerned with the reputation of the company and the integrity of its representatives than he is with the engraving on the certificate. It goes without saying that this confidence must not be shaken or disastrous results may be expected.

THE VALUE OF A BOGIE FOR EACH TOWN

The Liberty loan and other patriotic drives demonstrated the value of having a mark to shoot at, and we have endeavored—for competitive purposes—to set up an allotment of stock to be absorbed by each operating division of the company and for each of the many towns in our territory. In arriving at the allotment or "bogie" for future sales careful consideration was given to the results obtained from the first sale. The sales record was analyzed to show the number of shares sold per capita and per customer, and likewise the number of dollars of savings bank deposits, post office receipts and lighting revenue per share sold.

The results in towns where we supply lighting and power service directly to the ultimate consumer were segregated from those towns which are served by a separate operating company not allied to our own but purchasing energy from our system. A weighted average involving all factors was arrived at, and the stock allotments were placed by years for the ensuing three-year period. Interest and enthusiasm can thus be maintained over a long period, as the mark—although absolutely equitable and attainable—is a high one.

THE EFFECT ON PUBLIC AND PERSONNEL

The visible effect of this policy upon the general public and upon the employee salesmen has been most interesting. The public generally has welcomed the frank statements contained in our advertising matter, and much favorable editorial comment has been received. The shareholders have become stanch partisans of the company and defenders of its policies. Frequent expressions of surprise are heard that stock selling was not started sooner, in view of the unquestioned favorable effect it has had on public opinion. The rank and file of our employees have been benefited by their efforts to sell as well as by their own purchases of stock. Expert salesmen have been developed as well from the substation operators and accounting department as from the local managers and commercial forces, who are accustomed to meeting the public daily.

It is particularly noticeable that our wholesale power customers have generally invested in our securities, and we feel that this is a concrete evidence of their satisfaction with our power service and of their desire to see our company grow and develop in advance of their own power requirements. In almost every instance these consumers have cordially recommended the purchase of our stock to their employees and have been of material assistance to our salesmen in this connection. Another striking feature is that original purchasers of securities among the industrial workers are acquiring more stock as their means permit. The regular payment of quarterly dividends undoubtedly has a stimulating effect on "repeat" sales.

FOUR OF THE MANY BENEFITS DERIVED

In conclusion, it can be said that the experience of the Alabama Power Company gained in the sale of preferred stock to its customers and employees has proved successful in many ways, four of which are here set out in the seeming order of their importance:

First—As a means of interesting and educating the general public in the affairs of the company and building up a more friendly and co-operative spirit between producer and consumer.

Second—As a ready method of financing extensions and improvements by the company at a reasonable cost.

Third—As a means of educating the employee stock salesman in the policies and financial condition of the company and likewise increasing his sense of responsibility to the company.

Fourth—As a means of heightening the morale of the organization by giving to each employee owner of stock a financial interest in the welfare of the company over and above that of his daily wage or salary.

Lighting Metal-Working Plants to Increase Production

Proper Intensities, Spacings and Fixtures for Benches, Machine Tools, Sheet-Metal Work, Assembling, Painting, Etc.—General or "Localized-General" System of Illumination Is Satisfactory in Most Cases

By A. L. POWELL
Edison Lamp Works, Harrison, N. J.

ECONOMY in production is most essential at all times, but just now the question is of supreme importance in view of the present necessity for lowering costs. A mere curtailment of certain expenses does not necessarily mean a reduction in cost. Lighting might be cut down and the power bill reduced, but under the low intensity every movement would be slowed down and the costs per unit of output would mount at a surprising rate. To go further, lighting expense might often be increased to make desirable increases in plant efficiency, as high-level illumination without doubt makes it possible for each operator to turn out more work per day. Furthermore, good lighting will reduce unnecessary expenses in the form of compensation to injured workmen. Careful investigators have shown that a high percentage of industrial accidents are avoidable and that improper lighting is responsible for many of them.

General Illumination Being Widely Adopted

In shops as well as elsewhere, although localized lighting has advantages for certain operations, it has been in a large degree superseded by general illumination with more efficient, larger lamps. One reason for this replacement has been the movement toward the prevention of glare. With a well-designed general lighting system work can be carried on effectively, relatively few outlets are required, and efficient lamps can be used.

The most widely applicable system of machine-shop lighting has been termed "localized-general." Usually a higher intensity is required along rows of machines or benches, while a lower illumination is sufficient for the remainder of the room. This effect of varied intensity is accomplished by placing medium-sized lamps relative to the machines at a height of 9 ft. or 10 ft. (2.7 m. or 3 m.). The maximum intensity is then delivered on the work from the correct direction, and the spread light takes care of the surrounding areas, aisles, etc.

When the arrangement of a shop is such that the greater part of the area needs only a relatively low intensity of general illumination but some few operations require much higher intensity an economical plan is to supplement overhead lighting with local lamps judiciously placed. This is especially true of machine shops with automatic machinery, where a local lamp may be necessary when setting the tool.

The RLM standard dome reflector and bowl-enameled lamp is the most widely used equipment for general or localized-general illumination. The combination gives a desirable distribution of light with adequate illumination on vertical surfaces. It is efficient, easy to clean and so designed that direct glare is reduced to a satisfactory minimum. For use in drop lamps or portables the mill-type "Mazda" lamps are desirable.

Whatever system of illumination is chosen, it is good practice to provide light-colored walls and ceilings and refinish these at frequent intervals. Thus light which would otherwise be wasted is conserved. The importance of a well-supervised carefully planned system of cleaning lamps and reflectors cannot be overemphasized.

In many plants lighting circuits are not separate from the power circuits, but it is most desirable to separate them and provide 110 volts for lighting.

There are two characteristic types of buildings devoted to metal working which require different methods of lighting:

A. Those having relatively high ceilings, from 20 ft. to 60 ft. (6 m. to 18 m.), with a crane traveling the length of the bay (center bays). Figs. E and F show typical structures.

B. Those with low ceilings, from 10 ft. to 15 ft. (3 m. to 4.5 m.), having machines frequently driven by overhead shafting (side bays). Figs. A, B, C and D illustrate different forms of construction.

In the first case units must be hung high above the crane travel or angle reflectors placed on columns below the crane track. In the second case shafting and belts are likely to cast shadows. Larger, rougher work is usually carried on in the high-ceiling room and finer work in the side bays.

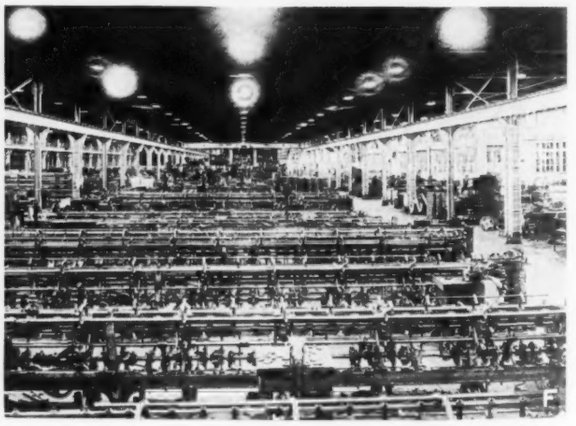
Overhanging parts of many metal-working machines tend to cast shadows on areas where good lighting is vital unless the proper direction of predominant light is obtained. This is of particular importance in the room where units must be hung low, for any individual machine generally receives most of its light from only one unit. In the other case, with lamps well above the floor, each machine receives light from a number of units, thus reducing the tendency for dense shadows to be produced.

The operations in the metal-working industry may be divided into four general headings: (a) Bench work, (b) machine-tool work, (c) sheet-metal work, (d) assembling, painting, etc.

Lighting Requirements for Bench Work

Benches fall in two general groups, single benches 2 ft. or 3 ft. (0.6 m. or 0.9 m.) wide along the walls and single or double benches away from the walls. Single benches along the walls should be lighted by a row of lamps about 6 in. (15 cm.) in from the forward edge of the bench spaced on 6-ft. to 10-ft.

Good Lighting Practice for Metal-Working and Assembling Shops



A—Typical machine shop well lighted by 200-watt "Mazda C" lamps in dome-enameled steel reflectors with glass diffusing globes on centers 10 ft. x 12 ft. and 11 ft. high.

B—A general lighting arrangement in a well lighted shop. Outlets are spaced 15 ft. x 14 ft. and the 300-watt "Mazda C" lamps in reflecto-cap diffusers are hung 11 ft. high.

C—General illumination of a power press room where 100-watt bowl-frosted Mazda lamps in deep-bowl steel reflectors are hung 9½ ft. high on 10-ft. centers. The illumination at the machine is 4 foot-candles.

D—Well lighted benches and assembly area. The 150-watt "Mazda C" lamps in glass-top dome reflectors are spaced on 8-ft. centers. Units for general illumination are close to the 12-ft. ceiling, while those over the benches are 8 ft. high. Outlets are located between vises.

E—Assembly floor of a shop devoted to heavy work. The 300-watt "Mazda C" lamps in dome reflectors are hung above the crane travel 20 ft. above the floor on centers 25 ft. x 28 ft.

F—Plant devoted to the assembly of textile machinery. The 300-watt and 500-watt "Mazda C" lamps in RLM standard dome reflectors are 18 ft. high on 20-ft. centers. A uniform intensity of 10 foot-candles is secured.

(1.8-m. to 3-m.) centers, with from 40-watt to 100-watt bowl-frosted or bowl-enameled "Mazda" lamps in deep-bowl or RLM standard dome reflectors. The size of lamp will depend on the fineness of the work and the spacing on the location of the vises or working points. It is desirable to locate units between vises rather than directly above them, for with this arrangement light is received from two sides and the operator is less likely to cast a shadow on the work. The units for bench lighting should be hung about 5 ft. (1.5 m.) above the bench.

Where general illumination is used for the shop with outlets symmetrically spaced—as, for example, four outlets on 10-ft. (3-m.) centers per 20-ft. (6-m.) bay—it is often feasible to move the first row of outlets 2 ft. or 3 ft. (0.6 m. or 0.9 m.) nearer the wall than would be necessary with a strictly symmetrical arrangement, and thus obtain satisfactory bench lighting with but little sacrifice of general illumination and a minimum number of outlets. Such a scheme is followed in the plant illustrated in D, where outlets are on 8-ft. (2.4-m.) centers.

For benches away from the wall general illumination is quite satisfactory, provided that fairly close spacing of outlets, not over 10-ft. or 12-ft. (3-m. or 3.6-m.) centers for ordinary conditions, is adhered to. Where the ceiling is very low or the work exacting, localized general illumination with the units arranged as suggested for benches along the wall is sometimes necessary. Again, where minute parts are handled, such as in a watch factory, or for very close inspection work, local lighting with low-wattage lamps in deep-bowl reflectors offers the most economical means of providing the high intensity (50 foot-candles and upward) which is necessary. This should, of course, supplement general illumination.

The intensity for bench lighting depends on the type of work carried on and ranges from about 6 foot-candles for soldering to 20 foot-candles for accurate fitting of machine parts.

It is almost always desirable to avoid specular or image reflections of the light sources from polished surfaces, yet there are a few exceptional cases. When inspecting glossy surfaces with natural light, the inspector holds the object so that the sky is reflected from its surface and thus detects irregularities. With artificial light it is necessary to duplicate this condition by having a relatively large diffusing source so placed that the inspector can view the reflection of this in the surface of the metal.

LIGHTING MACHINE-TOOL WORK

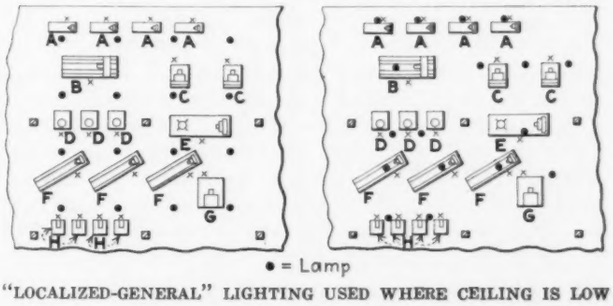
There are a few processes, including deep boring, punching and pressing of large blanks and lathe work on minute parts, such as watch mechanisms and the like, which require a local lamp. With these few exceptions machine-tool work can be most effectively carried on with the artificial lighting by overhead units. This statement is borne out by numerous satisfactory installations in constant use. Many mechanics will argue otherwise, thinking they cannot work unless there is a drop lamp directly over the tool, but this is largely a question of psychology.

The system to use for lighting machine tools depends on the type of building as pointed out. Strictly general illumination—that is, a symmetrical arrangement of outlets with reference to the bays—is quite satisfactory in the high structure, as indicated in Figs. E and F. There are many degrees of precision requiring different amounts of light. The following table indicates good practice for general lighting of machine tool work:

	Foot-Candles	Watts per Sq.Ft.
Rough work	4 to 6	0.6 to 0.75
Average work	6 to 8	1.0 to 1.25
Fine work	8 to 12	1.5 to 2.0

The RLM standard dome reflector with clear "Mazda C" lamps, when the hanging height is more than 20 ft. (6 m.), is probably the most universally applicable unit for these conditions. The size of lamp will depend on the spacing and intensity desired. The spacing in turn depends on the hanging height and size of bay. A safe general rule for a satisfactory installation in a machine shop of this nature is that the spacing should be about equal to the distance above the floor.

Where the ceiling is low in order that the predominant light may come from the proper direction, it is usually advisable to employ localized general lighting which is an intermediate practice between general and local lighting with common sense used in the placement of outlets. In the accompanying diagram is shown the difference in arrangement between a general and a localized-general lighting layout. In the case of the symmetrical arrangement an analysis shows that many



"LOCALIZED-GENERAL" LIGHTING USED WHERE CEILING IS LOW

This is a typical section of a machine shop. At the left is shown the arrangement of outlets for symmetrical general illumination in which many of the units are ineffective. For example, two are located directly behind the shapers, where they would be of little use. The lighting of the lathes along the wall is from the wrong direction as the headstock would cause a shadow on the work. At the right in the localized general arrangement the units have been placed with regard to the position of each machine. The abbreviations are: A—lathe (engine); B—large planer; C—shaper; D—drill press; E—lathe (turret); F—automatic screw machine; G—universal miller; H—emery wheel and buffer; O—lighting outlet; X—position of operator.

of the units are quite ineffective. In the other half of the diagram lighting units are arranged so that the correct direction of light results, the position of each machine being taken into consideration.

One might justly bring up the criticism that this is nothing but an extravagant system of local lighting providing a rather large lamp for each machine. On the other hand, one would be willing to grant that with our present standards four 100-watt or 150-watt lamps in a 20-ft. (6-m.) bay was not extravagant for general lighting. If the number of units in the four bays pictured is tallied, the general lighting system would show sixteen and the localized-general seventeen. Analyses similar to this of entire shops have been made time and time again, and the power required for a localized general system checks up very closely with the power required for a general lighting system. With an arrangement like this each machine receives the kind of lighting it requires. All the advantages of general lighting are obtained and the disadvantages of local lighting eliminated. (See Figs. A, B and C for examples.)

The size of lamp required for this scheme depends, as

before, on the fineness of the work. For rough work 75-watt bowl-frosted "Mazda C" lamps in RLM standard dome reflectors arranged approximately as shown will prove satisfactory. For average work 100-watt and for fine work 150-watt units of the same type are used. Where "Reflecto-cap" diffusers or similar devices are used to obtain additional diffusion, it is usually desirable to employ the next larger size of lamp than specified.

The following general rules indicate the desirable direction of light for the different types of machines:

Lathes.—From above to the right of the chuck, very slightly forward.

Millers and Shapers.—From above, in front, and preferably both sides.

Planers.—Large machines, above center of bed when at end of cutting stroke; small machines, see shapers. On planers where it is advisable to supply only moderate general illumination. A small lamp with reflector may often be mounted near the tool.

Drill Presses.—From above, in front, unless overhanging parts prevent, then slightly from the side.

Buffers, Grinding Wheels, Etc. — Above the wheel, slightly forward.

Saws.—In line with the saw, slightly forward.

PROPER ILLUMINATION FOR SHEET-METAL WORK

Many of the processes in a sheet-metal plant are similar to those treated under machine-tool works. Punching, pressing and stamping, contrary to the general impression, can be satisfactorily illuminated by the overhead system with the predominating light from the front and from the left or right of the operator. It is true that where very large pieces are pressed overhanging parts may be such as to make it quite essential to install drop lamps in the mechanism of the punch or press. On the other hand, the practice of having a bare unshielded lamp lying on the bed of the press continuously in the operator's field of view should be abolished. Eye strain is severe, fatigue is increased, and the glaring effect with its attendant after-image is very likely to be the direct cause of a crushed hand. One certainly can work with a greater degree of safety in a room lighted as pictured in F, where the white side walls eliminate shadows, than under the conditions too frequently noted in a punch room.

Cutting, shearing, edge setting, rolling, polishing, burnishing and similar processes can be satisfactorily illuminated by a system of general lighting providing an intensity of from 4 foot-candles to 8 foot-candles, depending on the fineness of the work and the degree of accuracy required.

General illumination is entirely satisfactory for the assembling, painting, etc., of the metal-working plant. This work usually takes place in the high center bay, and the rules laid down for machine-tool work in this area apply. The RLM standard dome reflector with clear "Mazda C" lamps symmetrically spaced above the crane travel as pictured in F or a combination of this unit and angle steel reflectors with bowl-enameled lamps below the crane travel are the two most nearly universal methods of applying light applicable here. The angle equipment has the advantage of directing the light from the side and producing excellent illumination on vertical surfaces. It is rarely of service alone and should be supplemented by overhead units to prevent the dense conflicting cross shadows.

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Unit Costs of New Bedford Generating Station

Economical Construction and Efficient Operation Shown — Analysis Prorated on Capacity Basis Yields Interesting Results

BEGUN about five years ago and completed to a present rating of 72,000 kw., the Cannon Street station of the Edison Gas & Electric Light Company, New Bedford, Mass., represents a construction cost of $4,027,029, or $58.98 per kilowatt, according to data filed recently by the company with the Massachusetts Department of Public Utilities. A description of this station was published in the ELECTRICAL WORLD of Feb. 23, 1918, page 397, and April 13, 1918, page 771. The plant now contains twenty-four boilers, aggregating 15,600 hp., and seven turbo-generators, of which one is rated at 20,000, two at 15,000, one at 10,000 and three at 4,000 kw. Surface condensers are used, and the plant is a tidewater installation supplying energy to many points in southeastern Massachusetts and to Cape Cod.

The cost summary printed below was prepared at the request of the company by Stone & Webster, Inc., designers and builders of the plant. In a letter accompanying the summary Stone & Webster stated that the costs of steam-power stations, usually expressed in dollars per kilowatt, are apt to be misleading unless the basis of computation is known, especially as regards the load-carrying capacity of the boiler plant relative to the installed turbo-generator capacity, the number of reserve units and the ultimate capacity of the condensing water tunnels. Published costs, the letter pointed out, are usually much lower than figures fairly representing the actual investments.

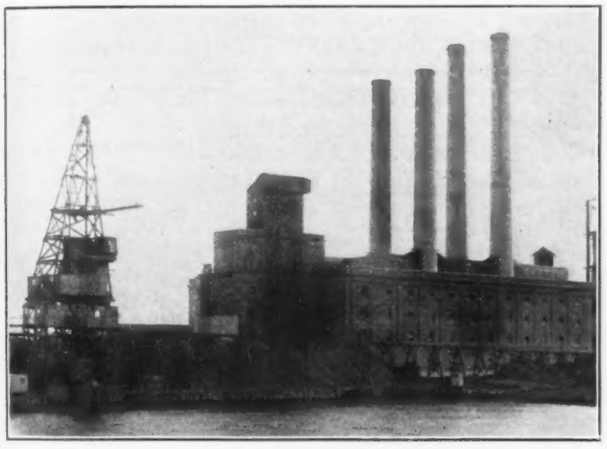
The following comparative schedule of costs contrasts the Cannon Street station with other modern plants:

	Per Kilowatt
1. Cost of Cannon Street (72,000 kw. and twenty-four boilers)	$59
2. Average comparable cost of other representative modern plants on which Stone & Webster have accurate data is about	76
3. The Cannon Street station if constructed now (summer of 1921) would cost about	73 to 80
4. Present-day power stations in general of about the same capacity as Cannon Street, constructed now (summer of 1921), cost on the average about	90 to 110

The comparable cost of this station prior to the last extension (No. 7 unit and eight boilers) was about $48 per kilowatt. It would be permissible to reduce the above stated cost of $59 per kilowatt by modifying slightly the assumptions in the computations, but a conservative figure of 104,000 kw. was taken as the capacity of the ultimate station in prorating items of construction and equipment now completed but designed to serve the fully developed station. The actual installed generating capacity, however, will be 132,000 kw., and this figure could be used in prorating costs if

special effort were made to arrive at a minimum cost per kilowatt. It was thought better to adhere to the figure stated above, as this will be more in line with the load-carrying capacity of the ultimate plant.

The reference to other modern plants of greater cost was intended to apply to stations of the type recently built by Stone & Webster, Inc., at Philadelphia and now being constructed in New York and Chicago. In each instance these stations are only one of a number of plants composing the generating systems of those cities, and, as they are expected to operate at much higher load factors than would be possible in New Bedford, the ratio of fuel costs to fixed charges is correspondingly higher. This justifies the use of econ-



LATEST STATION OF NEW BEDFORD COMPANY

omizers with higher steam pressures and superheat, with other features and refinements necessary to obtain the highest obtainable fuel economy. The additional investment required for such power stations, the letter states, would not be warranted in New Bedford, because a large percentage of the load is derived from mills and factories operating only five and one-half days per week. The load factor is comparatively low, so that the additional annual charges and labor costs would be more than the saving in fuel.

The above-stated cost of $59 per kilowatt indicates that the Cannon Street plant cost is very low, even if considered on the pre-war basis of prices, and the station today has a value correspondingly advantageous, its more modern equipment being considerably more reliable and efficient than corresponding equipment previously installed.

OPERATING COSTS FOR FISCAL YEAR 1920-21

Coal (1.02 cents per kw.-hr.)	$831,518
Oil waste, packing	5,140
Water	8,793
Station wages	116,575
Station expense	3,883
Station structure repairs	23,819
Steam plant repairs	52,427
Electric plant repairs	8,233
Total manufacturing expense	$1,050,390
Total manufacturing expense per kw. in cents	1.283
Maximum load, kw	31,800
Coal used, tons	73,379
Coal per kilowatt-hour, lb	2

Completed station will include 132,000 kw. in turbo-generators and forty boilers. In prorating costs, however, 104,000 kw. has been taken as the ultimate capacity of the station, as this is assumed to be approximately the load-carrying capacity on a stoker-fired coal burning basis and with the largest unit out of service. The prorating of costs as follows gives a basic cost per kilowatt for the various portions of the competed station. In general the station as completed (June, 1921) was considered as from 60 to 65 per cent of the ultimate station development.

CONSTRUCTION COST ANALYSIS NEW BEDFORD STATION

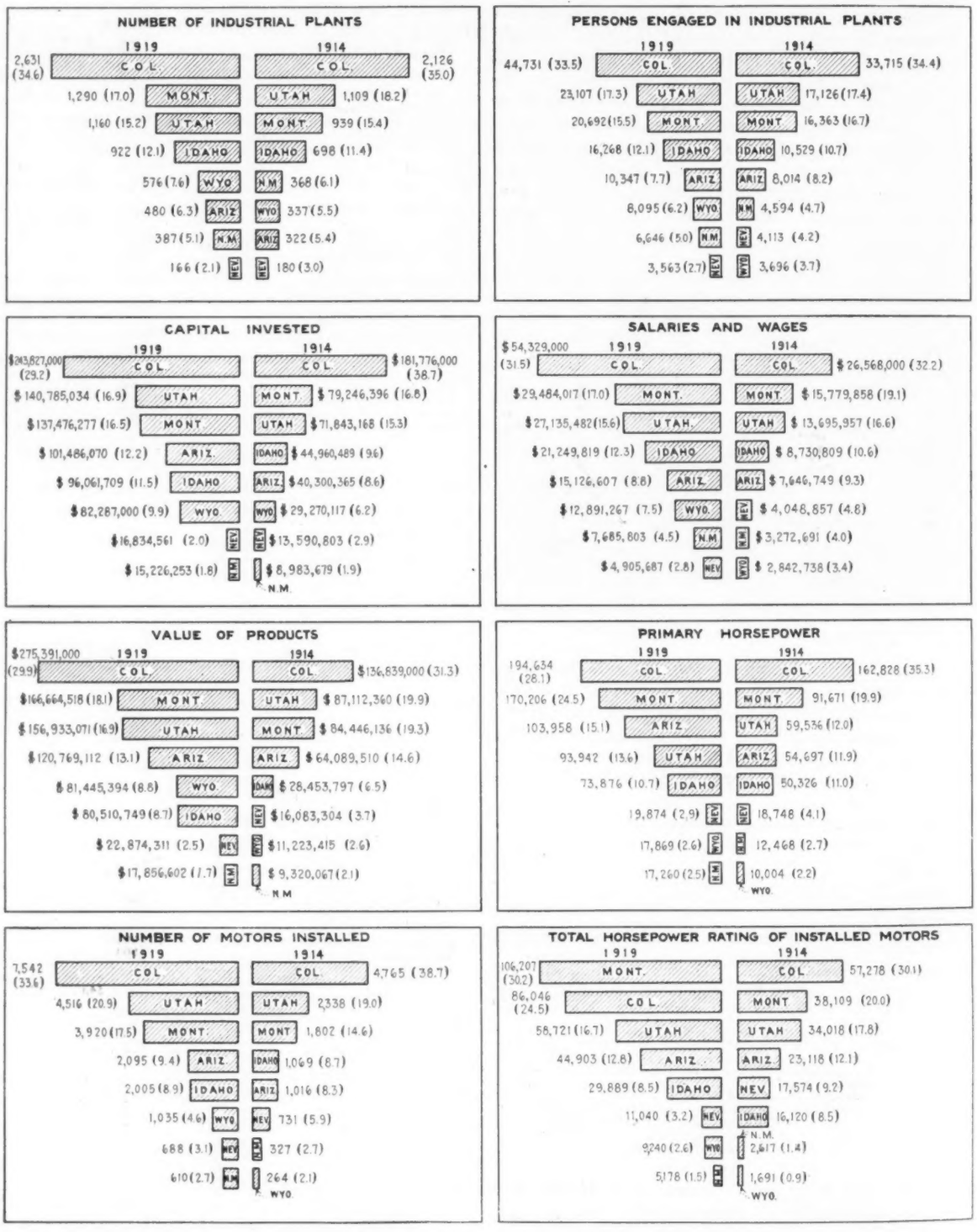
Item	Basis of Unit Cost (Kw.)	Cost Total	Cost Per Kw.
Dredging	104,000	$1,071.87	$0.01
Wharves	104,000	928.20	0.01
Station yard:			
Removing sheds, grading, fill, fencing, walks	72,000	11,226.69	0.16
Building:			
Turbine room	72,000	$182,400.00	$2.54
Electrical galleries	72,000	140,127.61	1.95
Boiler room	62,400	338,700.00	5.42
Total		$661,227.61	$9.91
Machine foundations:			
Turbine foundations	72,000	$22,671.57	$0.31
Turbine supports	72,000	30,683.38	0.43
Auxiliary foundations	72,000	12,652.79	0.18
Total	72,000	$66,007.74	$0.92
Boiler plant	58,700	563,331.61	9.60
Draft system:			
Stacks	58,700	$47,207.37	$0.80
Smoke flues, dampers, etc.	58,700	90,298.36	1.54
Forced-draft fans	58,700	30,282.42	0.52
Forced-draft air ducts	58,700	24,245.07	0.41
Total	58,700	$192,033.22	$3.27
Feed-water system:			
Pumps and heaters	58,700	$23,942.68	$0.41
Feed-water regulators	58,700	3,597.46	0.06
50,000-gal. water tank	104,000	5,129.28	0.05
Total		$32,669.42	$0.52
Condenser system:			
Tunnels in building	92,000	$112,054.98	$1.22
Tunnels outside building	104,000	30,000.00	0.29
Screen well and fittings	104,000	15,000.00	0.14
Condensers and auxiliaries	72,000	459,759.96	6.39
Total		$616,814.94	$8.04
Piping system	62,400	304,623.41	4.89
Coal and ash-handling plant:			
Coal unloading towers	104,000	$115,446.89	$1.11
Coal unloading trestle	104,000	21,950.00	0.21
Coal distributing auto railway, locomotive cranes, cars, tracks in yard	52,000	42,171.18	0.81
Traveling coal larries	104,000	18,501.51	0.18
Coal bunker (1,000 tons), skip hoist, receiving hopper, extension hoppers	58,700	65,154.39	.111
Ash hoppers, track spits	58,700	53,503.14	0.91
Ash bunker	104,000	21,976.95	0.21
Total		$338,704.06	$4.54
Generators:			
Turbo-generators	72,000	$770,696.91	$10.70
Air washers, ducts	72,000	30,720.12	0.43
Exciter sets	72,000	26,856.52	0.37
Total		$828,273.55	$11.50
Transformers:			
Bus-tie transformers	72,000	$24,340.86	$0.34
Station power and lighting	72,000	2,252.43	0.03
Total	72,000	$26,593.29	$0.37
Switchboard and wiring, generator, exciter, station lighting and power, mercury-arc rectifier and control battery panel and wiring, control battery, arc rectifiers, conduit cables and wiring	72,000	306,188.22	4.25
Auxiliary equipment:			
Traveling crane (50-ton)	104,000	$12,444.50	$0.12
Compressed-air system, oiling system, telephone system, low-service pump equipment, instruments, painting, etc.	72,000	40,949.57	0.57
Total		$53,394.07	$0.69
Machine-shop equipment	104,000	6,694.48	0.06
Testing and preliminary operation	72,000	17,246.70	0.24
Duct lines and manholes not included	.....	.....	....
Grand total		$4,027,029.08	$58.98

Stone & Webster state that in their opinion the low cost of this plant and the excellent economies obtained in operation over the period of years since the station was started place it among the best in the country.

From the company's return to the Massachusetts commission for the year ended June 30, 1921, it appears that the plant generated 1,112 kw.-hr. per ton of coal used. Its yearly load factor was 29.3 per cent, and the cost of coal was $11.09 per ton used and unaccounted for. The output for the year was 81,691,800 kw.-hr., and the cost of production at the station was 1.283 cents per kilowatt-hour delivered at the buses. The itemized station cost was as shown in table above.

An accompanying tabulation shows the unit costs for the major items of construction and equipment. Land, waterfront development and station supplies on hand are not included.

Mountain States Make Great Strides from 1914 to 1919



The Mountain States are fast overcoming their past isolation. The above data, taken from the 1919 census of manufactures, indicates that this large section of the nation showed the same large industrial growth during the census five-year period from 1914 to 1919 that was experienced in other more intensely industrial sections. A glance at the diagram will show that practically every state showed substantial growth.

Colorado leads the section in every item except horsepower of installed motors, in which Montana takes the lead. But some of the other states are rapidly coming to the front, as is evidenced by the fact that in every item the position of Colorado has declined several per cent since 1914. It does not seem likely, however, that Colorado will be displaced as the leader of the section for some years to come.

Industries of Mountain States Highly Electrified

Census of Manufactures for 1919 Indicates that More than 37 per Cent of Primary Power Is Electrical—Metal and Metal Products Industry Other than Iron and Steel Has Largest Amount of Electrified Power

IT APPEARS from data recently issued by the Census Bureau in connection with the 1919 census of manufactures that industries of the Mountain States made unusual strides during the five-year period from 1914 to 1919. In 1914 the total horsepower of the prime movers of the industries in this section was given as 460,278. This figure increased to 703,294 hp. in 1919, or more than 65 per cent. It is doubtful if any section of the country will show more favorable returns for the same period.

Table I gives the number of engines and motors and their horsepower as reported by the industries of the Mountain States in five-year periods beginning with 1899, at which time the first national census of manufactures was taken. Since 1899 the number of engines and motors has increased from 2,610 to 21,500, and their combined rating has increased from 122,514 hp. to 703,294 hp. The rapid development in the utilization of electrical energy as the source of power by the industries of this section is most interesting. In 1899 almost 96 per cent of the machinery was steam-driven and less than 5 per cent was electrically driven. During the twenty-year period from 1899 to 1919 a distinct change took place. In 1919 the proportion of the plant machinery driven by steam power had decreased to less than 63 per cent, while electrically driven machinery increased to more than 37 per cent.

That this large increase in the use of electrical energy for industrial purposes was a direct result of the expansion and service facilities of the central generating companies of the Mountain States is apparent from the figures in the table. The geographical section is one of unusually long distances and also one which, from the nature of its primary industries, lends itself to the successful development of the isolated or private generating plant. It is, therefore, of special significance that while in 1899 less than 50 per cent of the total rating was supplied by central-station energy, in 1919 this figure had increased to 74 per cent.

Table II shows the horsepower rating of the prime movers in the various industries of the Mountain States and also the prominence of the isolated electric generating plant in the various industries of the section. These figures indicate that the metal industry leads in the rating of installed electric motors, with the food industry a close second.

TABLE I—SOURCES OF POWER OF THE INDUSTRIAL PLANTS OF THE MOUNTAIN STATES

Prime Mover	Number of Engines or Motors					Horsepower — Amount					Horsepower — Per Cent Distribution				
	1899	1904	1909	1914	1919	1899	1904	1909	1914	1919	1899	1904	1909	1914	1919
Primary power, total	2,610	3,340	8,141	12,164	21,500	122,514	240,639	400,885	460,278	703,294	100.0	100.0	100.0	100.0	100.0
Owned	2,420	2,427	3,575	3,385	3,498	117,170	225,546	332,741	357,223	442,288	95.7	93.7	83.1	77.6	62.9
Steam	1,938	1,865	2,909	2,498	2,423	97,772	204,931	307,010	326,841	399,946	79.8	85.1	76.7	71.0	56.9
Engines	1,938	1,865	2,909	2,498	2,283	97,772	204,931	307,010	326,841	322,388	79.8	85.1	76.7	71.0	45.9
Turbines	*	*	*	*	140	*	*	*	*	77,558	.....	.....	.....	.....	11.0
Internal-combustion engines	166	233	421	609	868	1,237	2,296	4,188	6,871	9,971	1.0	1.0	1.0	1.5	1.4
Water	316	329	245	278	207	18,161	18,319	21,543	23,511	32,371	14.9	7.6	5.4	5.1	4.6
Water wheels and turbines	316	208	212	197	180	18,161	17,803	21,345	18,788	32,023	14.9	7.4	5.3	4.1	2.2
Water motors	*	121	33	81	27	*	516	198	4,723	348	.....	0.2	0.1	1.0	2.4
Rented	190	913	4,566	8,779	18,002	5,344	15,093	68,144	103,055	261,006	4.3	6.3	16.9	22.4	37.1
Electric	190	913	4,566	8,779	18,002	4,031	12,105	66,956	102,293	259,619	3.2	5.1	16.7	22.2	36.9
Other	0	0	0	0	0	1,313	2,988	1,188	762	1,387	1.1	1.2	0.2	0.2	0.2
Electric	190	913	6,721	12,312	22,411	8,545	35,419	113,984	190,525	351,224	100.0	100.0	100.0	100.0	100.0
Rented	*	*	4,566	8,779	18,002	4,031	12,105	66,956	102,293	259,619	47.2	34.2	58.8	53.7	74.0
Generated by private plants	190	913	2,155	3,533	4,409	4,514	23,314	47,028	88,232	91,605	52.8	65.8	41.2	46.3	26.0

* Not reported separately.

TABLE II—PRIME MOVERS INSTALLED BY THE VARIOUS INDUSTRIES OF THE MOUNTAIN STATES

Industry	Steam Engines (Horsepower)		Steam Turbines (Horsepower)		Internal-Combustion Engines (Horsepower)		Waterwheels and Turbines (Horsepower)		Horsepower Rating of Installed Motors — Run by Purchased Energy		Run by Energy Generated in Private Plants	
	1919	1914	1919	1914	1919	1914	1919	1914	1919	1914	1919	1914
Chemicals and allied products	2,211	0	714	.....	500	2	500	0	2,186	475	320	0
Food and kindred products	42,089	44,445	1,529	.....	3,774	1,720	5,696	3,392	42,106	12,863	6,360	5,724
Iron and steel and their products	698	1,465	248	.....	115	178	0	0	13,824	5,906	806	253
Leather and its products	140	.....	.....	.....	6	3	0	1	909	206	.....	1
Liquors and beverages	1,774	4,767	13	.....	0	50	151	153	1,020	1,469	0	897
Lumber and its products	64,500	67,723	12,606	.....	764	583	1,203	797	8,125	4,998	10,728	8,249
Metals and metal products other than iron and steel	36,720	35,386	41,241	.....	230	442	.....	0	24,658	6,374	25,363	13,700
Paper and printing	117	763	0	.....	766	654	17	42	6,969	3,714	63	363
Railroad repair shops	19,908	16,548	1,333	.....	461	277	138	201	30,975	11,798	7,995	5,102
Stone, clay and glass	4,022	4,819	2	.....	479	283	22	1,250	15,506	4,433	215	1,981
Textiles	75	0	0	.....	0	1	0	0	353	217	0	0
Tobacco	0	0	0	.....	0	0	0	0	15	12	0	0
Vehicles for land transportation	87	0	6	.....	1,250	73	11	0	5,321	271	33	0
Miscellaneous	150,047	150,905	19,866	.....	1,626	2,605	24,285	12,952	107,652	49,557	39,722	51,962
Totals for all Mountain States	322,388	326,322	77,558	.....	9,971	6,871	32,023	18,788	259,619	102,293	91,605	88,232

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

While We Wait for Congress

To the Editors of the ELECTRICAL WORLD:

Permit me to compliment you on the editorial appearing in the issue of the ELECTRICAL WORLD of Oct. 29 entitled "How Long, O Lord! How Long?" Your remarks are particularly pertinent at this time, and I agree with you that it is the duty of the business men to let their senators and representatives in some way know that we are wholly dissatisfied with the situation. I am writing all of the jobbers in Philadelphia today calling their attention to this editorial and suggesting that they try to do something to get action.

While writing you, I should like to call your attention to the article appearing in the September issue of *The Reminder*, page 12, entitled "The Federal Trade Commission." What do you suppose it cost the taxpayer to go through all the motions in connection with this silly order? It would not be impossible for any of us to give the commission cases of unfair competition that would make the giving of a few neckties as a premium to a salesman look like a trifle. F. R. ELLIOTT,
Elliott-Lewis Electrical Company, Inc., President.
Philadelphia, Pa.

Says Dimming Lights to Flash Time Is Impracticable

To the Editors of the ELECTRICAL WORLD:

The editorial in the ELECTRICAL WORLD of Aug. 6 and L. M. Klauber's comments on the Uruguayan practice of dimming lights to indicate the correct time have just come to my notice. Perhaps a few more remarks on this practice may prove not to be without interest.

In a town supplied by a single station, or a group of towns supplied by a single power plant, where all lighting service is fed by alternating current and where tramway service is supplied by induction-motor-driven generators, the thing would be relatively simple. After the public had been educated to the fact that dimming the light is a reminder to set their watches, the Uruguayan scheme would doubtless be a satisfactory way of indicating the time. The public can generally grow accustomed to anything.

Mr. Klauber indicated a few of those who would be particularly enthusiastic over the scheme, but it seems to me that he omitted some of those to whom it would really be a boon. I refer in particular to certain power company employees—those whose duty it is to smooth the fur of the peevish customer. They would have a stock excuse or explanation for all service complaints, and the load dispatchers of an extensive interconnected system would be provided with a routine operation in which they would only have to insure abnormal and simultaneous operation of voltage regulators at power houses, voltage regulators on synchronous condensers, induction-type voltage regulators on feeders and battery control switches in direct-current substations.

When the operating engineer saw the graphic record of voltage, instantaneous load, "morning newspaper" and other little reminders of what life really is, he would certainly be pleased to note that in carrying out the little Uruguayan operation the operators and dispatchers between them had managed to flash not only the time but also a couple of 100-kv. bushings, that 20,000 kw. of load had been lost for ten minutes or so, and—oh, well, what is the use?

To the man in charge of the physical operation of a large generating and transmission system it is quite a surprise that any one should favor what would amount to a deliberate daily interruption of service.

Riegos y Fuerza del Ebro, F. M. GILLESPIE,
Barcelona, Spain. Operating Engineer.

Suggestion to Bring Out Six Leads to Terminal Block of Motors

To the Editors of ELECTRICAL WORLD:

In the plant with which the writer is connected there are motors operating on both 60-cycle, two-phase, four-wire alternating current and 25-cycle, three-phase, three-wire alternating current. When we have trouble with the two-phase motors it is very easy to "ring out" the two single phases for grounds or short circuits as all four wires are outside leads to the motor. To do the same testing with a three-phase, three-wire motor, however, one has to remove the end bell over the stator connections and disconnect the star or delta connection before ringing the separate phases. This inconvenience could be eliminated if more manufacturers would make motors that have some kind of an easily uncovered connection block on the outside of the frame to which all six wires could be brought out. Then to make a test for short circuits or grounds it would be an easy matter to remove the connections and "ring" the single phases without removing an end bell. N. S. DAVIS.
Batavia, N. Y.

Base Demand on Kilovolt-Amperes

To the Editors of the ELECTRICAL WORLD:

Referring to the editorial in the ELECTRICAL WORLD for Oct. 29 in regard to power factor, it seems to me that the question as to whether the kilovolt-amperes should be taken at time of maximum load of the customer or maximum load on the station has been largely solved in the present rate schedules, in which the demand is based on kilowatts. It would seem to me that the proper solution would be simply to change the basis of demand in the present rate schedules from kilowatts to kilovolt-amperes. F. V. GALLAUGHER.
Lake Charles Railway, Light & Waterworks Company,
Lake Charles, La.

False Representations

To the Editors of the ELECTRICAL WORLD:

In a recent letter to your paper regarding false representations of electrical engineering I inadvertently used the expression "emblazoned with Niagara's turbines." The New York Electrical School uses a cut similar to this in its advertising, and as I had no intention of hurting that school or, for that matter, any other legitimate school, and have only good will toward it, will you kindly print this explanation?

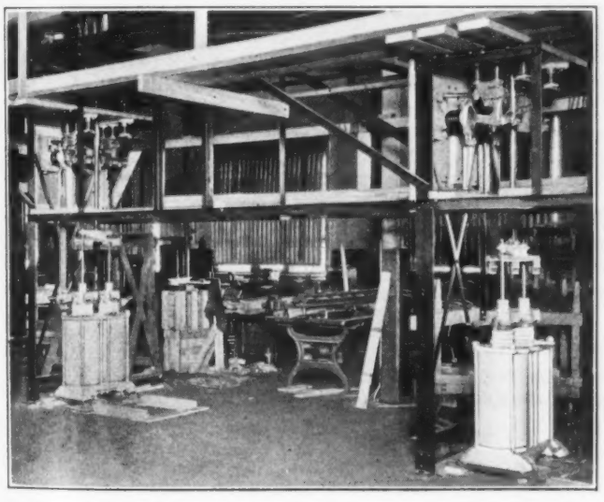
Fulton, N. Y. FRANK E. WOOLEY.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Operation of Oil Switches on Isolated-Phase System

ALTHOUGH the switching equipment of the new Calumet station of the Commonwealth Edison Company was mentioned in an article on page 761 of the April 2, 1921, issue of the ELECTRICAL WORLD, a more detailed description of the switch operation may be of interest. As stated in the former article, the system is known as the isolated-phase system, in which all breaker poles, disconnecting switches and bus work of any particular phase are installed in cell structures isolated from other phases, thus preventing all possibility of interphase short circuits. The switching equipment is mounted in three stages or tiers, one above the other. The lowest comprises the oil circuit breakers, the



ISOLATED-PHASE CIRCUIT BREAKER AND DISCONNECTING SWITCH FOR NEW CALUMET STATION

second the disconnecting switches, and the top the main operating mechanism and the unit mechanisms.

Each breaker is operated by a heavy main operating mechanism which consists essentially of strong spiral springs and a motor. It is so constructed that the motor acts to compress the springs, thereby storing up sufficient energy in them for both the closing and the opening strokes of the oil circuit breakers. The springs, released, actuate a series of operating pipes which act on three unit mechanisms to throw the breaker to either the closed or the open position. The main operating mechanism is controlled by a three-button control switch with visual indicating signals. A white light indicates that the breaker and disconnecting switches are open and the compression springs are relaxed. When the first control switch is closed the motor compresses the springs, closes the disconnecting switches, and a green light indicates that all is in readiness for the closing of the oil circuit breaker. The second control switch is then closed, which causes the mechanism to close the oil circuit breaker, a red light indicating that the circuit breaker has been closed. When it is desired to open the breaker, the third control switch is closed, and the breaker trips out, the disconnecting switches open, and the white light appears.

The breakers and disconnecting switches are both operated from the breaker mechanism, the latter being timed to open shortly after the breaker opens. When the circuit is opened it cannot be closed again until the springs of the main mechanism are compressed by the motor and energy for the closing and opening stroke restored. The disconnecting switches are adapted to manual operation, but, as a safety measure, interlocks between them and the breakers prevent the opening or closing of the switches when the breaker is closed.

The breakers and disconnecting switches are of General Electric Company manufacture. They are triple-pole, single-throw, and are made in two ratings of 600 amp. and 2,000 amp., 150,000 volts.

Loud-Speaking Telephones and Signals Assist in Power-House Operation

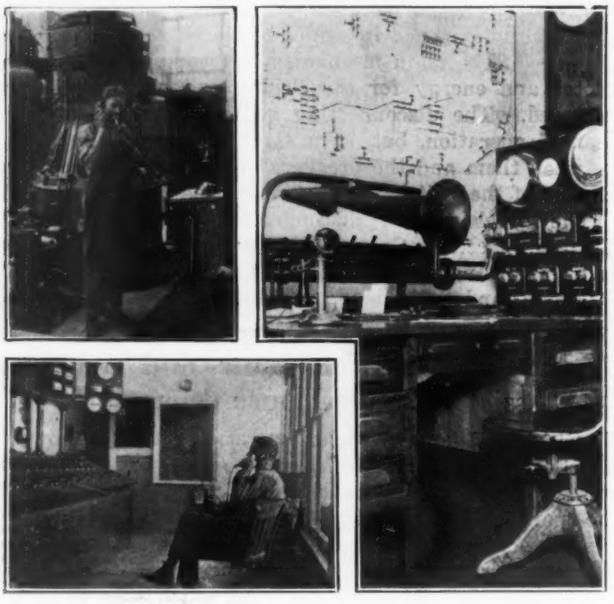
RELIABLE and efficient operation of any power house, whether it be hydro or steam, depends to a very great extent upon thorough co-operation among the operators and oilers or engineers and firemen. Likewise the co-operation of the station operators with the dispatcher greatly influences the operation of the system as a whole. Realizing the vital importance of such co-operation and desiring to promote it to a high degree, the San Joaquin Light & Power Corporation has been installing modern systems of signaling, indicating and communication in the power houses of its system.

The first step in this direction was taken several years ago when a high-power loud-speaking telephone was installed in the dispatchers' office of Fresno. The telephone lines of this company, like those of many other power companies, are carried along on the same pole lines with high-voltage transmission circuits and are more or less subject to inductive interference. The use of repeating coils and relays such as are employed by the commercial telephone companies is out of the question on such lines, owing to frequent high-voltage disturbances due to transmission-line failures.

This dispatching set, known as the "Wonder-phone," shown in the accompanying photograph, is simply a telephone set on a big scale designed to transmit a greater volume of power and to amplify greatly the received energy. The set has proved a decided success in "getting through" over lines on which ordinary telephone apparatus would be inoperative. This set has other good features worthy of mention. For instance, owing to the fact that it virtually "talks out loud," the dispatcher does not have to hold a receiver to his ear. Thus he has both hands free to work with his

notes and records and is not subject to the sharp "raps" in the ears which he would get if he had an ordinary receiver over them.

Until the advent of the "Magnavox" telephone transmitter the use of an ordinary telephone in power houses was very unsatisfactory, to say the least, except when installed in a soundproof booth. The use of booths is not conducive to the best co-operation, particularly in summer weather, as the operator does not care to engage in an extended discussion with the dispatcher about operating conditions. The principal objection to the booth, however, is that it takes the operator away from his switchboard, where load and power factor conditions may be changing even as he is talking to the dispatcher, or trouble may develop that would demand his immediate presence at the board. Use of the loud-speaking telephone is being extended to all the power houses of the San Joaquin system. The accompanying photographs show its use in the Kerckhoff power house. It will be noticed that the operator does not have to leave his position in front of the board to talk to his floorman, who in turn is at his post of duty with the machines in full view. The oiler in the turbine pit also has a telephone so that all three men may communicate with each other amid the noise of the plant, none of the side tones being transmitted.



LOUD-SPEAKING TELEPHONES INCREASE CO-OPERATION BETWEEN DISPATCHER, OPERATOR, ENGINEER, ETC.

Left, upper—Floorman does not have to enter a booth to talk to operator (left, lower), who remains in front of his board. Right—Dispatcher's set which allows communication over noisy lines.

In the steam plants the loud-speaking instrument is even more valuable for intercommunication between operating gallery and boiler room. The fireman requires a certain amount of notice before load may be picked up or dropped and it is only through his close co-operation with the operator that the plant may be operated reliably and efficiently.

For signaling in large and noisy plants a steam whistle—or a compressed-air horn operated by a magnet valve if the plant is run by water power—has been found very satisfactory. The compressed-air horn gives a pleasing tone of great volume, easily distinguished in the noisiest plant. The magnet valve is operated from the exciter bus through high-voltage push-buttons at the telegraph stations. An ordinary vibrating-type electric bell is used for signaling the operator. In the steam plants the same type of magnet valve is used, but it operates a steam whistle for signaling.

R. C. DENNY,
Operating Engineer.
San Joaquin Light & Power Corporation,
Fresno, Cal.

Indicator Stick Tells Whether Circuit Is Alive or Dead

BEFORE working on cables it is absolutely essential to know that they are not energized, and for this purpose a "live-wire indicator" has been developed by the Consolidated Gas, Electric Light & Power Company of Baltimore. It is the practice in this company for the purpose of safeguarding men who are to work on cables to place grounds on all three conductors at both ends of a 13,200-volt underground cable. There is considerable hazard involved, however, for the men who apply the grounds unless they can be absolutely sure that the cable is dead. The "live-wire indicator stick" affords a very reliable means for determining whether a conductor is alive or not before the operator attempts to attach any ground wires. The details of this indicator are shown in the accompanying drawing, from which it will be noted that the construction is rugged.

It consists essentially of a micarta tube inclosing a copper tube which connects with a binding post outside. It is easy to handle and weighs only 7 lb. When the metal contact of the indicator touches the conductor of a 13,200-volt, 25-cycle circuit and is drawn away, there is a spark approximately ½ in. long. The noise from this spark is clearly audible and serves as an indication even though the spark may not be seen. A reliable indication is given on a three-phase circuit with a potential as low as 4,000 volts even when the frequency is as low as 25 cycles.

The application of the indicator stick may be better understood by reference to the rules of the company for high-potential conductors, a portion of which are given below.

INSTRUCTIONS FOR HIGH-TENSION CIRCUITS

The following shall be the procedure for grounding 13,000-volt or 26,000-volt circuits or apparatus:

1. Instructions must come from load dispatcher.
2. Be sure that circuit is clear.
3. Put up safety boards, covering the phases of the adjacent circuits.
4. Call the station to which the cable connects and satisfy yourself that the oil switch and "disconnects" are open. This must be done in addition to instructions given by the load dispatcher.
5. Test for potential with indicator stick to satisfy yourself that the cable to be grounded does not show any spark or sizzling sound. Then repeat test with indicator stick on a live cable to make sure that the indicator stick is in good shape. After live cable has been tested for comparison, again test the conductor of cable to be grounded, so as to be doubly sure the cable is dead, before actually applying the grounds.
6. If this test indicates that the circuit is clear and dead, call the system operator and say, "I am going to short-circuit and ground No. — cable." If the system operator tells you to go ahead, place a ground wire on a long pole and touch conductors to be grounded with the ground wire.
7. Put on the regular grounding jumpers provided for this purpose. The grounding jumpers should then be connected to ground. Then apply the ground to the first conductor of the circuit in such a manner that a solid connection is made from the beginning, because, should the

conductor have been made alive since testing, the making of a quick solid connection prevents the formation of a bad arc and injury to the workman. Make the connection to the second and third conductors of the circuit in the same way, assuming in every case that the circuit might be alive when the ground is applied.

Never allow any part of the body to touch a conductor on which the ground has not been made. The fact that one conductor has been successfully grounded does not necessarily indicate that the other conductors are clear, and, furthermore, the static effect on an ungrounded transmission-line conductor caused by neighboring live circuits is in some cases sufficient to cause death.

In removing a ground the same precautions must be observed, namely, not to touch the conductors after the ground connections have been removed. The jumper should be disconnected first from the line conductors and last from the ground connection.

The load dispatcher will order all short circuits and grounds applied to and removed from any transmission or distribution circuits.

When receiving orders over the telephone pertaining to switching of any kind, you will, in addition to repeating the order, spell the number. For example, if you receive this order: "You are ordered to cut out No. 999 feeder," you will answer as follows: "I am going to cut out number nine hundred and ninety-nine feeder," and immediately spell the number.

Operators in stations will not permit assistant operators to ground any circuit or apparatus after it has been made clear without a personal inspection to make sure that the circuit is clear and ready for grounding.

Besides the foregoing use, the indicator stick is of very definite value in phasing out circuits, and in determining the continuity of an overhead transmission circuit.

R. H. LANG,
Chief Operator.

Consolidated Gas, Electric Light & Power Company,
Baltimore, Md.

Simple and Quick Method of Locating Correct Brush Position

A NUMBER of articles on locating the neutral point on commutators have been read by the writer, but none of the methods described is so simple or quick as that employed in the shop with which the writer is connected. In this shop every motor and generator is tested as follows while running. The floor man has a piece of lamp cord which is skinned back about 1½ in. and the wires fanned out. This is held against the end of the commutator and moved back and forth. The intensity of the spark at the center of the fanned-out wires locates the neutral point.

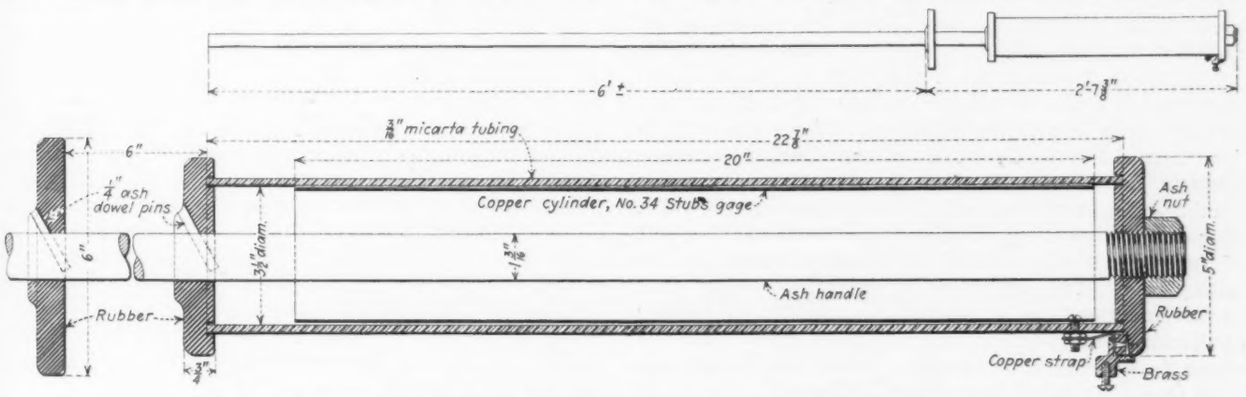
A. C. ROE.

Detroit, Mich.

Betterment Work in Industrial Plants Improves Operating Conditions

IN ELECTRICAL distribution systems long-continued operation gives opportunity for unfavorable conditions to develop unless checked by close inspection and prompt action. This is no criticism of the reliability of electric service, which has long since become famous for its ability to withstand both neglect and abuse, but in order to keep installations up to "concert pitch" and thus obtain the most efficient performance possible systematic analyses of operation are essential. As a guide to others in checking bad conditions a few examples of easily remedied cases encountered in practice will be cited here. Some of the faults noted were due to improper selection of equipment and others to its neglect in service. Taken in group, they emphasize the importance of so-called "little things" in the performance of electrical apparatus.

In one industrial plant examined a field rheostat in a generator excitation circuit was found to have too few points to permit a graded control of voltage. It was found that when the generator was operating at 117 volts one division adjustment of the rheostat reduced the potential to 100 volts. This was due to the fact that the generator field at normal voltage was operating at a point just below the knee of the magnetization curve, or at a point which gives maximum change of terminal voltage for variations in the field current. In another case a switchboard was installed where a wooden door swung back against a large rheostat when closed. The shunt leads for the ammeters were uninsulated, and temporary lines for charging batteries were left for permanent use.



THIS TEST STICK DRAWS A LOUD BUZZING SPARK FROM A LIVE HIGH-TENSION LINE

The failure to maintain the lighting installation in an industrial shop led to the gradual loss of reflecting material from shades and to resulting poor illumination. Open wiring in a tidewater shop led to the gradual corrosion of leads with actual breaks in some cases. The fire hazard of this installation was thus increased, apart from the loss of service threatened. Carelessness was also noted in regard to the installation of lamps on motor circuits instead of on independent lighting leads. Motor-starting switches are often left without cleaning for long periods. In one case it was found that the arms of the starter handles did not return to the "off" position owing to the amount of residual magnetism in the starter magnets. It was recommended that this be prevented by the use of shellac and very thin paper to break the actual contact.

In another establishment it was found that the

motors were not all purchased for the same standard voltage. In several cases 110-volt motors were used and run above their normal speed on 115 volts. Too high fusing of motors for proper protection was encountered, with exposed runs of bare wiring near motor frames. Fuses of 400-amp. rating were installed for a motor which was properly fused at 250 amp. Another case occurred where wiring passing over a motor came in contact with piping and also changed size without electrical reasons therefor. Abrasions on the insulation of control coils, burned and neglected starting-box contacts, inoperative springs on starters and non-adjustment in contactors were also found in this installation. Two starters were found inclosed in a box containing rags, cans, etc. Moisture-proof and properly lined cabinets were advised here, together with the listing of all starters of which the contacts tended to burn and the maintenance of a few spare parts for starting switches.

Unclean fuse and cut-out contacts were found to cause annoying heating effects in one industrial plant. This was especially noticeable on knife-blade types of fuse clips and contacts rated at 85 amp. and over. The absence of asbestos backing and the mounting of switches and cut-outs directly on wooden backs without asbestos protection were also encountered in an old plant which had not enjoyed proper supervision from its staff or from outside inspectors. There was a tendency toward the multiplication of switches and cut-outs through non-standardization, thus cutting down the number of spares required. In one case vibration of a floor due to operating machinery led to the falling out of fuses from clips placed on bases attached to the ceiling below, and for future work it was advised that no more ceiling fuse installations be made. The former location also made it a slower and more difficult task to renew fuses in case of blowing. Some overloaded circuits were also noted in this establishment.

The foregoing examples illustrate that many weaknesses in service result from the lack of acute inspection and subsequent revision at low cost of undesirable practices. The expense of systematic maintenance through proper inspection, locally or from without a plant, is not to be weighed in the same scale as the petty economies of short-lived character that appear to be possible where installations are allowed to run with little care.

E. S. LINCOLN,
Portland, Me. Consulting Engineer.

Methods of Stripping a Stator

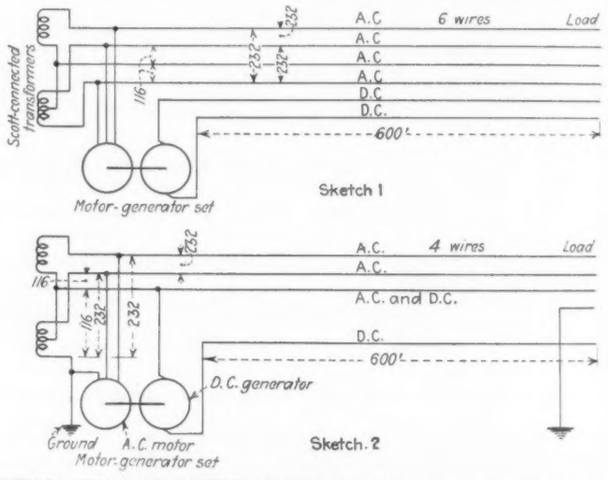
STRIPPING the coils from a stator with partly closed slots is a job which is rather difficult to do satisfactorily. Some repair shops drive out the wedges and remove the coils by lifting the wires out of the slots one by one. This method is not bad if the motor is completely burned out, but most motors have only a few coils burned, and then the method is slow, tedious and expensive. We generally cut off one side of the coils all the way around with a sharp, flat, long-tapered chisel, making the cut as close to the laminations as possible. Then, laying the motor flat on the side where the coils have been cut, we hook a chain fall on the other end, taking out four or five coils at a time. The greatest objection to this method is that it pulls the laminations out of alignment, and unless the winder is careful, he will get into difficulty inserting the new coils as some of the sharp edges of the laminations will puncture.

Another method we sometimes use is to connect a low potential across one or two poles in series and allow enough current to flow completely to burn insulation and wedges. This method perhaps has fewer drawbacks than the previous one. The last two methods apply also to closed-slot machines.

ARTHUR R. MCDONALD,
McCleary, Wallin & Crouse, Chief Electrician.
Amsterdam, N. Y.

Alternating and Direct Current Carried Temporarily on Same Wire

TO SAVE copper feeders in a recent temporary installation at the factory of a large publishing house, both alternating and direct current were carried over the same wire. Three-phase alternating current at 232 volts, single-phase at 116 volts and 230-volt direct-current were supplied over four wires, using the ground for a fifth conductor. Operation of both alternating-current and direct-current motors, as well as supplying current for photographic arc lamps, besides the



FEEDER CONDUCTORS ELIMINATED BY CARRYING ALTERNATING AND DIRECT CURRENT ON SAME WIRE

usual lighting problems, required this complex service. The alternating current was obtained from the three-phase side of Scott-connected transformers fed from the two-phase lines of the power company, with a middle tap on one of the power transformers for 115 230-volt three-wire service. A motor-generator set supplied the direct-current service.

The original installation was destroyed by fire, and while the plant was being rebuilt and re-equipped a small temporary factory was served by the original transformers and a temporary belted motor-generator set. The temporary factory was about 600 ft. distant from the original factory and temporary motor-generator set, so the transmission of even small blocks of power required considerable copper. To save this copper it was decided to use the temporary service wires for wiring the new plant. There were six of these wires, and the problem was to release as many of them as possible for use in wiring the new plant before the temporary plant was shut down.

The writer remembered having seen in the ELECTRICAL WORLD some time ago a brief reference to the possibility of using the same wire for both alternating and direct current, and it was decided to try this plan. The six wires supplying service for the temporary plant

were arranged originally as shown at the top of the diagram. Then one leg of the direct-current circuit was eliminated, tapping the ends to one leg of the three-phase circuit. This worked out so well that another step was taken and one leg of the three-phase circuit was eliminated, using the ground in place of it, as shown at the bottom of the diagram. Under these conditions the temporary plant was satisfactorily operated for two months without any voltage disturbance between the circuits. The voltage on either circuit seemed to be entirely unaffected by the load on the other circuit. This was proved visually on the lighting circuits and by means of a voltmeter on both circuits.

The remaining temporary service wires were eventually taken down and used as feeders in the permanent plant, thus avoiding a heavy investment in copper. The temporary service, of course, was interrupted at this time.

F. H. GAGE,
Pacific Press Publishing Association, Superintendent.
Mountain View, Cal.

Load Test on Induction Motor Without Special Apparatus

IT IS often a problem to load up induction motors without regular testing apparatus and intruments to get comparative results of their behavior under load. Such a problem is likely to arise when a firm contemplating the purchase of a large number of motors wishes to satisfy itself as to what make suits it best and therefore orders sample machines of different makes to compare and try out.

In such a case the sample induction motors would most likely be of the same horsepower and speed, especially if of the smaller sizes. One of the best methods for testing would be to belt two motors of different makes together with pulleys having diameters of such ratio that when one motor is running at the full-load speed the other motor will be driven at synchronous speed plus the slip as given on the nameplate. For instance, if the nameplate is stamped 1,720 r.p.m. synchronous speed is 1,800 r.p.m. The slip is therefore 80 r.p.m., and when belted together one motor should run at 1,720 r.p.m. and the other at 1,880 r.p.m. The two machines are then separately tried out to see that they run in the same direction, after which both are put on the line. The motor with the large pulley will act as a motor while the one with the smaller pulley will act as a generator. Slip is slightly less running as a generator than running as a motor, which would make the load slightly high but near enough for an ordinary try-out. The two machines, although working slightly overloaded, take but a small amount of power from the line, just enough to supply the losses of heat friction, etc. For close comparison on heating, thermometers should be placed on the laminated core and winding and covered with putty. Readings must be taken for a definite length of time or till constant temperatures are attained. Repeating the operation with the pulleys changed on the two machines so as to make the one formerly running as a motor run as a generator and vice versa give the best basis for comparison.

On large machines run in the manner described the work done and the temperatures are quite nearly alike whether acting as a generator or as a motor. On small machines the difference is greater, owing to their lower efficiency, greater slip, etc.

Machines of the same dimensions and speed are simpler to connect together, but it is not necessary that they be alike in these respects if the right pulleys are selected. The essential requirements are that the horsepower ratings must be equal and that the pulley sizes are such that when hooked together by a belt the driving machine will have to drop down to full-load speed while the driven machine is pushed on above synchronous speed till it pumps all the energy received from the driver (minus the losses) into the line. Any adjustment in load must be made by changing the pulley ratio.

East Orange, N. J. PHILIP G. BERNHOLZ.

Motor Record for Large Plant

1006-2M-8-19

INDUCTION MOTOR SHEET

No. of Motor 135 N

Location of Motor, Mill No. Bag Floor 2nd, No.
Rated H. P. of Motor 250 Frame No. 817688
Make of Motor G. E. Volts 2200 Cycles 60
Source of Supply #3 Feeder, #4 Sub-station
H. P. Required for Belts and Shafting 80
H. P. Developed 247 - 255 Avg.
Type I Poles 12 Form L
Speed Syn. 600 Full Load 588
Dia. Pulley 33½" Face 30" Bore 6"
Length of Hub 17"
Keyway Length 17" Width 1½" Depth 5/8"
Weight with Base 8000 Wt. without Base
Cens. of holes motor feet, Width 24" Length 41"
Cens. of holes motor base, Width 35" Length 41"
Dia. Base Bolts 1 3/8" Dia. Motor Bolts 1 5/16"
Height of Base 4 5/8"
Cen. of Motor to Bottom of Motor Foot 24"
Total Height from Base to Top of Motor 48½"
Cen. of Motor to Cen. of Pulley 38"
Cen. of Motor to End of Tail Bearing 35½"

REMARKS: Motor on floor, 6-240 Sp. Twister
5 Sew Mch, 1 Press, 1 Bag Folding
not running when test was made.

MACHINERY DRIVEN

1 Brush, 1 Press, 1 Bag Folding Mch.
3 Inspecting Fr. 5 Sew Mch.
4-132 Sp. Twisters, 4-240 Sp. Spin Fr.
2-192 " " 16-228 " " "
6-240 " " 26-6 Sp. Winders
1 Balling Mch. May 19, 1921

COMPLETE INFORMATION ON THIS SHEET

A PERPETUAL inventory of about 2,000 motors in service at the Amoskeag Manufacturing Company's plant in Manchester, N. H., is maintained by the electrical department in the form of 4¼-in. x 7¼-in. loose-leaf sheets. One of these, designed for induction-motor use, is reproduced herewith. In this compact space provision is made for about thirty-eight data items as location, make, rating, dimensions, drive details, machinery driven and loading information. The record is unusually complete in listing driven machinery, the source of energy supply and mechanical dimensions useful in shifting motor locations.

Amoskeag Manufacturing Co., FRANK L. CLARKE,
Manchester, N. H. Chief Electrical Engineer.

Emergency Operation of Self-Cooled Transformers

ON ACCOUNT of self-cooled transformers being designed on an ambient temperature of 40 deg. C., advantage of the full rating of the transformer may not be obtained where temperatures are above this point. This happened in a substation of the Southern California Edison Company, and artificial cooling became necessary. To meet the conditions air ducts were installed around the base of the 5,000 kva., single-phase, maximum-rated, self-cooled radiator-type transformer and so arranged with openings between the radiators as to direct the flow of air supplied by a motor-driven blower. With this method of artificial cooling these maximum rated transformers will carry 25 per cent overload continuously with the same winding temperatures as at full load without artificial circulation of air.

San Francisco, Cal. FIELD EDITOR ELECTRICAL WORLD.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

The Need for Closer Association

Extracts from a Recent Address by Stephen I. Miller Before the British Columbia Electrical Association

ELECTRICAL development fulfills two economic laws: First, as you develop electric power you decrease the unit cost of a kilowatt-hour and thus the cost of electric service; second, no matter how much you develop that power you never exhaust it. The importance of all this is made clear when it is appreciated that at the present rate of consumption the petroleum supply of the United States will be exhausted in ten years. Every available hydro-electric horsepower must therefore be harnessed to preserve the continuity of industry.

A kilowatt of electricity is generally divided among four interests—the central station, the manufacturer of appliances, the jobber of appliances and the merchandiser. These four interests are inseparable, and the lack of a mutual understanding on the part of these groups will retard not only individual interests but also the public welfare. It is high time therefore that the electrical industry should appreciate the power of association, organization and concentration.

Electrical co-operative associations and leagues have come into existence as an economic medium for the promotion of better business methods in the industry. A man with no knowledge of his wiring and merchandising costs, with poor methods of salesmanship, with an unattractive store interior, with display windows unappreciated, and with no knowledge of the benefits of advertising, is a menace to good business.

Leagues and associations constitute a rallying point for the promotion of service and intelligent business methods. Co-operative effort may express itself in electrical exhibits, electrical homes, co-operative newspaper advertising, salesmanship, classes, merchandising classes and motion pictures. Electrical exhibitions and electrical homes are among the most effective means of publicity. I consider these, above all, as an aid to the spirit of co-operation.

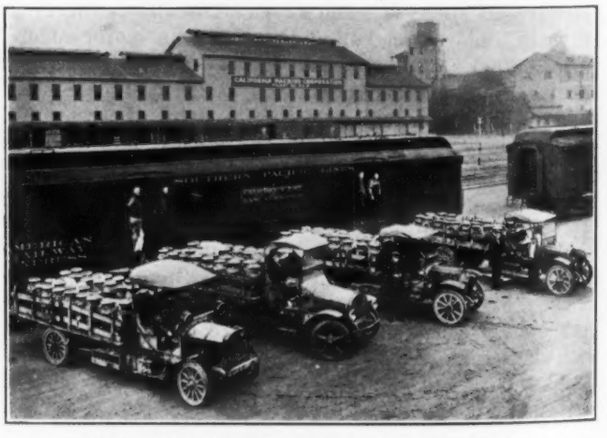
In the electrical business we have manufacturers who put out inferior articles, jobbers who extend credit to the wrong people, contractor-dealers who dump everything into their stores, outlaw jobbers, "curbstoners," men who won't speak to the man across the street, and so on. Not one contractor-dealer out of forty has any idea of his cost of doing business. Associations to straighten out these tangles are meant to lift the electrical business to a higher plane, and to provide the publicity needed to raise capital to develop power.

Electrical organizations in the United States are making a modern mass move for the extension and betterment of electrical service. Men capable of such co-operation will be the leaders in industry tomorrow. If, by normal evolution, it is possible to reach a certain stage in the use of electricity without any organization or effort, and by co-operation and organization we can reach that point only twenty-four hours earlier than we would otherwise have reached it, how much that will mean in human welfare and net profits. If we hand on to posterity only one day's acceleration, this organization will have amply repaid itself.

Three Hundred and Fifty Thousand Baby Trout Planted by One Central Station

LAST month the San Joaquin Light & Power Corporation planted 300,000 small trout along Kings River, in California, where the company now has in course of construction a hundred-million-dollar hydro-electric development. The fish ranged in length from 1 in. to 2 in. and were obtained by the power company from one of the hatcheries of the California Fish and Game Commission. The picture shows the 125 15-gal. cans containing the trout being loaded on the company's trucks at 6:30 in the morning. They were immediately taken to the end of the wagon road in the Kings River country, where part of the trout were liberated. The remainder were loaded on pack trains and carried to the higher mountain streams. This was in addition to 50,000 trout planted in Kings River ten days before.

The hydro-electric development of this section has made necessary the building of good roads, substantial bridges and better means of communication in a country that heretofore has been inaccessible, except on horseback. Now motor travel is increasing, with a large



LOADING 350,000 SMALL TROUT ONTO SAN JOAQUIN COMPANY'S TRUCKS

number of fishermen coming in. The San Joaquin company in adopting this method of propagating trout in the mountain streams is performing a public service which is appreciated by every angler who visits the Kings River country. It is just another evidence that utilities are really builders of the public domain and not destroyers of natural scenery as has often been charged.

A Suggestion for Bank Advertising

ONE OF the leading banking houses of the South, the Central Bank & Trust Corporation of Atlanta, Ga., recently published this advertisement in the local papers for the purpose of impressing upon the public the importance of the light and power company as a factor in industrial and economic development. It is a fair and honest appraisal by a conservative financial house of the part utilities play in advancing the public welfare and community interest. This is a type of constructive bank advertising that might well be suggested by a utility to its local banking institutions. Many of them would undoubtedly be glad to apply the idea and it would result in much good influence in suport of the public service corporations, creating, as it does, good will for both the bank and the utility company at the same time.

A CONSTRUCTIVE BANK ADVERTISEMENT

How Old Employees Were Turned Into Successful Appliance Salesmen

BY F. M. HOUSTON

Sales Engineer Elmira Water, Light & Railroad, Elmira, N. Y.

AT THE beginning of this year, the outlook for business in Elmira was very poor, because of the fact that practically every industry was at a standstill and business in general was very poor. We decided that the best thing to do was to try to increase our lamp socket load by the selling of small appliances. During the war, when the industries were paying enormous wages, some of our oldest employees left us and went with the different factories around the town. When the slump came they were naturally thrown out of a job and as they never worked for any other company but ours, they naturally turned to us for something to do. It was while trying to take care of these men that we hit upon the scheme of selling small appliances. These men were mostly men who had been with the company for anywhere from twelve to twenty years, consequently were glad to get work on almost any terms. We, therefore, devised this proposition.

We would pay them $1.00 a day salary and a commission on small appliances as follows: Irons $1.00, toaster stoves $1.00, toasters $1.00, vacuum cleaners $6.00, washing machines $7.50 and $12.50. In addition to this a 5 per cent commission was paid on all lamps sold. We furnished each salesman with a grip in which he could carry one flatiron, one toaster stove and about ten lamps, and started them out on a straight house to house canvass. We started originally with two men and have added since then eight more.

A sales meeting is held each morning and the men are required to give an account of prospects which are filed away according to dates. We have a large blackboard showing the daily, monthly and yearly record of each man and we also give them a quota in dollars for the month. We did about four times as much advertising as we did last year and the results secured have been perfectly amazing, considering the fact that all the men were absolutely green at the selling game and had to be instructed as to the proper way to approach a prospect and close a sale.

The result of this plan is that in the first nine months of this year we have sold $15,000 worth of merchandise more than the entire year last year, and have exceeded any year's business for the past seven years. The mark we are shooting at and which we fully expect to hit is to double last year's sales.

The salesmen have fared very well in regard to the amount of money drawn and our selling expense has been averaging about 15 per cent of our selling price. While this figure is high, yet when we consider the additional benefit we are getting from increased load, we feel that it is justified.

What Other Companies Are Doing

Chicago, Ill.—August is usually the lightest season of the year in customer ownership preferred-stock sales, but the Byllesby subsidiaries placed a total in excess of $415,000 par value among customers during that month. Compared with August a year ago, sales increased 10 per cent. Sales of preferred stock direct to customers during September aggregated $575,000 in 1,250 separate sales. This compares with $483,000 in September, 1920, and is an increase of 19 per cent over last year.

California.—During the first eight months of this year 2,534 electric appliances were sold by the dealers in a certain district in this state. Some of the outstanding items which made up this total were 704 electric flatirons, 167 toasters, 158 percolators, 460 fans, 124 curling irons, 164 washing machines and 210 vacuum cleaners.

Muskogee, Okla.—Walter G. Humphrey, meter reader of the Muskogee Gas & Electric Company, claims to have established a record for speed in reading meters. According to a story in the Muskogee *Times-Democrat*, Mr. Humphrey read 500 meters in 315 separate households in six hours.

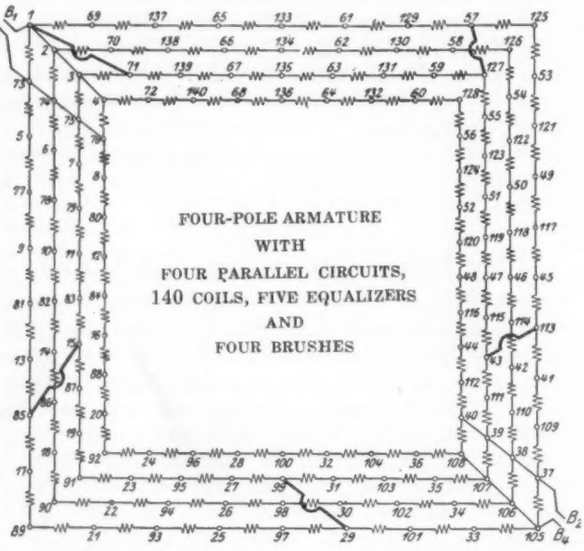
Boston, Mass.—An active effort to increase the use of electrical appliances in the homes of officers and employees of central-station companies managed by Charles H. Tenney & Company of Boston is in progress. Statistics presented at the recent New London convention of the New England division, N. E. L. A., brought home the importance of cultivating this development within the central-station household, and the Tenney companies were among the first to take to heart the conditions revealed and seek more thoroughly to "sell themselves" the electrical idea.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
of the World

Generators, Motors and Transformers

Simplified Representation of Direct-Current Armature Windings.—J. BOJKO.—It is customary to show a direct-current armature winding cut open parallel to the shaft and developed into a plane. If it is desired to show all of the coils and their connections with one another and with the commutator bars, a very complex drawing will result, with innumerable crossings of lines, forming a rather bewildering picture. Still more complication is introduced in the case of larger machines when there are equalizing bars and their connections to be shown. The author suggests a method which is simplicity itself, complete and very clear. Instead of showing the individual coils as they are arranged bodily upon the armature, he shows their electrical arrangement, which is essentially a multiple series-parallel connection. To make the picture still more comprehensive, a four-pole machine winding is represented as a square, a six-pole machine as a hexagonal, etc. All electric connections and the location of positive and negative brushes become logical and clear. The author claims that such a representation is a great help in hunting down trouble with the aid of a millivoltmeter.—*Elektrotechnische Zeitschrift*, Oct. 6, 1921.



Lamps and Lighting

Tendencies in Electric Lighting.—HAYDN T. HARRISON.—Description of good lighting practice for factories, workshops, schools, offices, etc. The importance of high intensities and suitable reflectors is emphasized. —London *Electrician*, Oct. 7, 1921.

Use of the Ulbricht Sphere in Measuring Reflection and Transmission Factors.—ENOCH KARRER.—A survey of the methods and instruments used in measuring reflection factors embodying recent suggestions of the use of the Ulbricht sphere. A transmissometer based on the same theory and a simpler reflectometer that will enable determination of reflecting factor to within 10 or 15 per cent are described.—*Bureau of Standards Paper No. 415.*

Difficulties in School Lighting.—FRANK H. WOOD.—The requirements governing the lighting of schoolrooms are stated succinctly as follows: Windows to be grouped on the left of the pupils, opposite their desks and not beyond the line of the front desks; windows to extend to ceiling and be equal to one-fifth of the floor area, their height from the floor to be at least one-half the width of the room; windows must be without transoms, and there must be no unnecessary width of mullions.—*Transactions I. E. S.*, Vol. 16, No. 6,

Generation, Transmission and Distribution

Electricity Supply Systems in Large Cities.—PHILIP TORCHIO.—A lecture on the best operating practices in the large cities of the world and a history of the development of the industry that has led up to these practices. Details of distribution features are thoroughly covered.—*Bulletin of the Johns Hopkins University, School of Engineering*, 1920-21.

Use of Static Condensers to Improve the Power Factor.—R. VARRET.—The author gives formula and graphic charts for the determination of the proper amount of capacity to be used for different inductive loads on alternating-current lines. The use of easily assembled batteries with 25-mf. condensers is advocated, the author being a manufacturer of these units. The elements represent small cylindrical containers, 105 mm. in diameter and 230 mm. high, and are tested with 600 volts for 220-volt lines. Each unit contains an inbuilt fuse to cut it out of service in case of puncture.—*Revue Générale de l'Electricité*, Oct. 22, 1921.

Application of Reactances to Large Systems.—W. A. COATES.—Account of a specific investigation of a system where two existing stations are to be linked to a third new plant by means of a high-voltage cable network. —*Beama* (British Electrical and Allied Manufacturers' Association), October, 1921.

Testing High-Tension Insulators.—An enumeration of the methods for testing high-tension insulators employed by the Central Electrotechnical Laboratory, France. Electrical and mechanical tests are both described.—*Electrical Times*, Oct. 13, 1921.

Calculations on Three-Phase Mercury Arc Rectifiers.—H. NIELSON.—In this mathematical paper the author derives all necessary formulas for the calculation of three-phase mercury rectifiers which are fed from "Y-Y" connected transformers. The current distribution in the auto-transformer with or without a series inductance is considered. A very simple equation is given to determine the relation between the primary reactance and the desired voltage drop. The algebraic results are further explained by two concrete examples. —*Elektrotechnische Zeitschrift*, Oct. 20, 1921.

Herlandsfossen (Norway) Hydro-Electric Plant.—An unusual feature in the construction of this plant is an unlined pressure tunnel having a static head of 450 ft. at its lower end. This and other hydraulic features of the 14,000-hp. plant are discussed.—London *Engineering*, Oct. 7, 1921.

Traction

Electrification of Swiss Railways.—A discussion of three-phase, single-phase and continuous current as used by railways in other countries and their future application to the Swiss railways. The conclusion is that for Switzerland the energy will be single-phase or continuous current and the choice will depend upon economic conditions.—London *Engineer*, Sept. 30, 1921.

Electrification Progress on Italian Railways.—GIOVANNI B. SANTI.—Electrification of lines with grades and heavy traffic has been carried out to some extent in Italy, and at the present time other lines are being electrified. This article tells of the past accomplishments and the plants for the future.—*Railway Electrical Engineer*, October, 1921.

Installations, Systems and Appliances

Electrical Development in Steel Mills.—R. B. GERHARDT.—Report of the progress made during the past year in extension of electric drive to steel mills. Advances made in control equipment are also discussed. The use of electrical energy for heating in the electric furnaces and also in the apparatus operated at lower temperature and the possibilities of electrifying railroad yards are explained.—Paper presented before Association of Iron and Steel Electrical Engineers.

Dynamic Versus Mechanical Braking.—GEORGE W. RICHARDSON.—A comparison of the two forms of braking as applied to cranes and hoists employed around steel mills.—*Journal of Engineers' Club of Philadelphia*, October, 1921.

Performance and Cost of Superpower System.—ARTHUR R. WELLWOOD.—An enumeration of the power and energy requirements, past and estimated future loads, load factor and diversity, present generating facilities, fuel requirements, investment cost of future systems and possible saving.—*Power*, Nov. 8, 1921.

Units, Measurements and Instruments

Two Pyrometers for Measuring Very High Temperatures.—G. KEINATH.—The principle of neither of these instruments is new. One measures by the contrast between a hot lamp filament and the hot body. The other concentrates the heat from the hot body upon a small thermocouple the emf. of which is measured on a millivoltmeter calibrated in degrees. These pyrometers give the desired reading within a few seconds, with an accuracy of ± 10 deg. C. The article seems to favor the thermocouple type called "ardometer" and gives a detailed description of it. The thermocouple itself is a tiny disk 2 mm. to 3 mm. in diameter and is inclosed within an evacuated glass bulb. At the highest temperature (2,000 deg. C.) a potential of 15 millivolts is obtained. Plotting the curve on logarithmic co-ordinates, the relation between the emf. of the thermocouple and the temperature is almost a straight line. Contrary to the method used in previous instruments of a similar type, a glass lens was used to concentrate the heat upon the disk, instead of the very much more expensive lens of fluorspar.—*Siemens Zeitschrift*, September, 1921.

Telegraphy, Telephony and Signals

Recent Advances in Long-Distance Telephony.—FRANK B. JEWELL.—An outline of the important advances which have been made in long-distance telephony in the past ten or twelve years. The development and use of loading coils and the more recent advances which have been made in carrier-wave transmission, making possible transcontinental communication, are discussed.—*Bulletin of the Johns Hopkins University, School of Engineering*, 1920-21.

Pilotless Warboat.—L. CHAUVEAU.—A boat built by the French Navy during the war was controlled from an aëroplane. The construction of the control mechanism is described in this article. This boat was patterned after a German pilotless boat which attacked a French pier. The German boat was driven by a gasoline motor and electrically controlled by means of a 50-km. one-conductor cable. The boat contained two gasoline motors such as are used on zeppelins, operating twin-screw propellers capable of giving the boat a top speed of 40 knots per hour. Seven distinct operations of the engine and the rudder could be performed by means of the remote electric control. The control was essentially by means of a ratchet mechanism, a different number of ratchet impulses corresponding to certain actions of the boat. A small gasoline-electric generator set and a storage battery furnished the energy for the operation of the different motions. A special time relay was in series with each of the seven distinct positions, so that every one of the different operations was executed only after the contact-making ratchet mechanism stopped for a certain minimum time on a given position. In case of imminent danger to the boat an eighth position of the contact apparatus was provided for the self-destruction of the boat by ignition of its own charge.—*Radioelectricité*, Sept. 21, 1921.

Miscellaneous

Electric Propulsion of Ships.—W. E. THAU.—This paper deals with the electric propulsion of ships and compares it with other methods of driving as regards reliability, weight, space, cost, operation and maintenance.—*Journal A. I. E. E.*, November, 1921.

Insulating Materials.—W. H. NUTTALL.—Some theoretical chemical considerations regarding insulating varnishes, solid substances and synthetic gums.—London *Electrician*, Oct. 14, 1921.

Electric Towing of Ships Along Canals.—C. REINDL.—The large number of canals in Europe and the heavy traffic along them make this paper of great interest for European countries. The author gives many data, gained from actual experience, on towing locomotives and storage-battery-driven boats and comes to the conclusion that both storage-battery locomotives and storage-battery power boats give good and economical service, the former, however, only in conjunction with a trolley system, which is discontinued at places where it interferes with structures along the canal.—*Elektrotechnische Zeitschrift*, Oct. 20, 1921.

Physical and Electrical Tests of Slate.—MERTON O. FULLER.—The object of the tests reported was to determine the suitability of slate for use in the electrical industry. Tests were made for porosity, tensile strength, compression, flexure, toughness, hardness, expansion, results of high temperature and ohmic resistance.—*Bulletin of Fritz Engineering Laboratory, Lehigh University*, 1921.

Books of Technical and Industrial Interest

ELEMENTS OF DIRECT-CURRENT ELECTRICAL ENGINEERING. By H. F. Trewman and G. E. Condliffe. London: Sir Isaac Pitman & Sons, Ltd.

This work has been prepared to bridge the gap existing between the elementary textbooks on magnetism, simple current electricity, etc., and the more advanced books written from the point of view of design. It will present to students the theoretical principles underlying direct-current engineering without superfluous details. Typical examples of various machines are described and explained in such a manner that the principles of other types of instruments and machines will be readily understood.

THE ENGINEERING INDEX. 1920. New York: The American Society of Mechanical Engineers. 586 pp.

Nearly 14,000 items referring to articles in about 700 engineering and allied technical publications are listed in the new "Engineering Index" just issued by the American Society of Mechanical Engineers. The alphabetical dictionary arrangement found so convenient and satisfactory in the 1919 volume has been retained. This method is being used in place of the divisional arrangement previously employed. Each item contains the exact title of the article indexed, the author's name where the article is signed, the name of the periodical in which the article appears, the volume, number and date of publication and the number of pages and illustrations in the article. It also includes a brief note summarizing the articles indexed. This feature, together with the numerous cross references throughout the volume, makes it possible for any one consulting the index to confine his search to those particular articles which bear directly upon his problem.

TABLES OF COMPLEX HYPERBOLIC AND CIRCULAR FUNCTIONS. By A. E. Kennelly, Cambridge, Mass.: Harvard University Press, 1921. Second edition, 240 pages.

The second edition of this well-known book has recently appeared after an interval of some seven years and is essentially a reprint of the first edition, with the following additions: (a) The fundamental tables (I to V), which were originally computed for the range of 45 degrees to 90 degrees in the slope of the argument of the entering vector quantity, have been extended to include the range of 0 degree to 45 degrees. The new material is intended for use in track-signal computations and other circuits of low frequency, small capacitance, and large leakance. (b) A table similar to Table XI has been added which expands its region so as to make it applicable to short lengths of alternating-current line having negligible inductance and leakance per unit length. (c) A collection of formulas on hyperbolic functions has been reprinted from the Smithsonian "Hyperbolic Functions" by Baker and Van Ostrand.

Dr. Kennelly deserves considerable credit for having published these tables and also the atlas in which hyperbolic functions of complex quantities are represented in the form of curves. It would be a mistake, however, to consider the task as completed. In the present tables the steps between consecutive entries are too large, and the use of the tables therefore involves considerable labor in double interpolation. The author himself realizes this fact and states in the explanatory text, on page 153, that his applications for financial assistance were unsuccessful and therefore the steps had to be made larger than originally intended. Because of this drawback it seems that at the present time a shorter method of computation consists in resolving a hyperbolic function of a complex variable into the real and imaginary parts and using the Smithsonian tables of real hyperbolic functions and ordinary good tables of circular functions. It has been the experience of educators that students invariably get tired of double interpolations in Dr. Kennelly's tables and prefer the second method. It is to be hoped that financial aid will be forthcoming and that detailed tables will be published, making an interpolation in many cases unnecessary or very simple.

In his explanatory text the author seems to emphasize the geometric interpretation of hyperbolic functions too much, presumably for the sake of the charts in the atlas. In actual experience in electrical problems such a geometric interpolation is superfluous and rather confusing. It might be well in the next edition to add a purely analytical definition of hyperbolic functions, in terms of exponentials and of infinite series, by analogy with circular functions, the latter being also defined analytically and not geometrically. This will save the reader the necessity of going over several tedious pages of properties of hyperbolas and ellipses not necessary for an understanding and use of the tables.

A chart atlas supplements the tables, enabling interpolations to be effected from direct inspection to a moderate degree of precision for most practical purposes. The charts are numbered to correspond with the tables. By means of this atlas the hyperbolic sine, cosine or tangent of any complex quantity can be directly read between the limits $x = 0$ to $x = \pm 4$ and $y = 0$ to $y = \pm$ infinity, expressed either in rectangular or polar co-ordinates.

THÉORIE DU COUP DE BÉLIER. By Lorenzo Allievi. Translated from the Italian into French by the author and D. Gaden. Two volumes, 64 illustrations.

The investigations of Allievi on hydro-dynamics are well known. His works have been cited by many other authors and his experiences have often been the basis on which others have made further investigations. The present books deal with the theory of what is generally termed "water hammer," that is, the motion of a column of water in a conduit at the moment of opening or closing. The entire investigation is purely mathematical, very original methods of analyzing being employed. Special attention has been paid to the difficult problem of resonance in pipe lines. In all cases the results obtained mathematically are plotted as curves or tabulated, so that by introducing concrete values actual numerical results may be quickly arrived at. Of the two volumes composing this work one contains the text proper and the other sixty-four illustrations (curves and diagrams).

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Rain Comes to the Aid of Southeastern Power Companies

FAIRLY general rains in the past few days have served to assist materially in relieving what had all the appearance of a water shortage among the Southeastern power companies. The Tennessee Power Company, the Columbus Power Company and the Georgia Railway & Power Company have water going over the dams at their low-head developments, while the Central Georgia Power Company has been able materially to increase its storage. The Georgia Railway & Power Company was likewise able to accumulate additional water in its impounding reservoir above the Tallulah Falls development, and while the Alabama Power Company has at this time not begun to feel the effect of these rains at its developments, this company will be benefited in the next few days.

It will be recalled that the Carolina Power & Light Company, Raleigh, N. C., was forced to curtail service during the month of August because of low water and obtained partial relief through the transfer of power from the Alabama Power Company to the Georgia Railway & Power Company, the latter company in turn delivering to the Southern Power Company for delivery to the Carolina Power & Light Company.

Utility Operators View Secondary Inflation with Alarm

WORD comes from the Middle West that public utility operators in that section are beginning to view with some alarm what appears to be a secondary inflation of the prices of general commodities. Prices of steel products, copper, oil and other materials are beginning to advance, and operators are asking themselves if this is the beginning of a general increase in prices all along the line.

"The secondary inflation period has become of serious moment," one important operator of utility properties said. "Unless there is a halt in the upward trend of prices, the utilities may find themselves in worse shape than they were two years ago and forced to ask for increased rates."

Business and Industry Report Increased Activity

THAT there is a real basis for the general statement of improved business already issued by the Department of Commerce is revealed by the detailed departmental survey for October just issued. A careful study of the figures presented shows that, considered as a whole, business and industry have moved forward. In the majority of industries production and consumption increased and stocks declined.

Textile consumption figures continued to advance and exports of raw cotton were substantially larger than a year ago. The iron and steel industry evinced a slight improvement during September and copper production turned upward. Bituminous-coal production for September increased slightly over August, while anthracite production showed a slight decline. Reports on building and construction contracts awarded in twenty-seven Northeastern states showed a gain in value of 11.5 per cent over August in place of the usual seasonal decline. The September total in value of new construction is the largest monthly total this year and is the largest September total on record.

Business failures declined in number by 6 per cent, and in extent of liabilities by 13.8 per cent, as compared with August. New incorporations were 15.7 per cent less than in August, but September provided an increase of 48.5 per cent in new capital issues, the largest month since April.

Indiana Commission Explains Why Utility Rates Cannot Be Slashed

REDUCTIONS of public utility rates to correspond with the marked decline in prices of other commodities cannot be expected by utility patrons because the rates were not advanced commensurately with the general increase of prices during the war period, according to the annual report of the Indiana Public Service Commission, which has been completed by Frank B. Faris, examiner for the commission.

"The past year has been one of rather marked decline in most commodity prices," the report says, "and has been characterized by a business depression. The commission is aware of the fact that the public is impatient to see lowered rates for public utilities. It is impossible, however, for the commission radically to reduce utility rates to correspond with the decrease in farm products, etc. During the past year there were only 538 formal cases filed, as against 827 the year before, a reduction of 35 per cent.

"There is, however, a sound distinction to be made between the cessation of demand for increased rates on the part of the utilities and a slashing of utility rates on the part of the commission. Utility rates did not increase in proportion to or contemporaneously with the rapid increase of prices during the year 1919 and a part of 1920. Had utility rates been increased in direct proportion to and simultaneously with all commodity prices and labor costs, they could have been reduced in direct proportion to the decrease in these elements in utility expense."

In another part of the report, however, the commission expresses the hope that the economic readjustment will work for a reduction of rates commensurate with utility costs. "It was during the fore part of this fiscal year," the report says, "that prices reached the maximum upward limit. It is some satisfaction to make the observation that prices of materials and labor have started on the decline, which ultimately will result in

better public service, a more liberal policy of making public utility extensions and finally a reduction in rates commensurate with the reduction in cost of utility service."

Constructive Series of Electric Vehicle Lectures in New York

AN INTERESTING series of talks is planned for the winter by the electric vehicle bureau of the New York Edison Company. The program, still in a tentative form, has been designed for the interested prospective user who wants facts from those who have operated electric trucks.

The first meeting is scheduled for Dec. 2, in the company's auditorium on Twenty-seventh Street. The topic of the evening, "The Field, Application and Economy of the Electric Street Truck," will be discussed by Arthur Williams, general commercial manager of the company; C. G. Lambert, general manager Westcott Express Company, New York, and H. S. Baldwin, General Electric Company, West Lynn, Mass. James H. McGraw, president McGraw-Hill Company, will act as chairman at the opening meeting. The program arranged for the other meetings is as follows:

2. Symposium on the construction of electric street truck drive by truck manufacturers.
3. "The Application of Electric Trucks in Postal Service."
4. "Proper Charging of Electric Truck."
5. "A Word from the Oldest Users of Electric Trucks in New York City."
6. "Winter Operation of Electric Trucks."
7. "Electric Trucks in Department Store Business," "Electric Trucks in Laundries" and "Electric Trucks in Ice and Ice Cream Business."
8. "Industrial Trucks."
9. Talk by advertising agency.
10. "Tires and Lubrication."

Conference Held This Week on International Radio Regulation

A SUMMARY of the results of the international radio meeting held this summer in Paris has been prepared by the Bureau of Standards. This work of the Interallied Technical Committee on Radio Communication was done in anticipation of an international conference on communication. Feeling that it was desirable that plans be formulated to insure suitable representation of United States communication interests at this conference when held, Secretary of Commerce Herbert Hoover invited interested radio concerns to send representatives to a conference held on Friday of this week at the Engineering Societies Building, New York.

Radio communication is now regulated in accordance with the London convention of 1912, and the revolutionary developments in radio since that time have made new regulations imperative.

The Interallied Technical Committee, which sat at Paris from June 21 to Aug. 22, considered primarily a set of fourteen questions prepared by the preliminary communications conference of the five principal powers, which met in Washington in 1920. Two delegates of the Department of Commerce were present. One of the fundamental questions was the classification of waves. The final conclusion really adopts two wave classifications, one by types and one by classes.

The Paris conference did not attempt to allocate particular ranges of long waves to particular countries, but formulated the technical principles on which such an allocation should be considered by the next International Communications Conference. The technical principles adopted were in brief these: (a) Lower-frequency waves should be used for the longer distances and higher-frequency waves for the shorter distances; (b) stations situated in the same general locality and working at similar distances should in principle use adjacent frequencies; (c) each nation should use only the smallest possible number of wave lengths necessary to carry on its radio communication, and (d) use should be made of the directional properties of radio whereby the number of communications carried on in a given region may be increased by employing the same frequency a plurality of times.

Postmaster Hays Indorses Proposed Department of Public Works

THE Postmaster-General expects to see the Department of Public Works become a reality. In an address on Nov. 15 before the Fifth Avenue Association of New York Mr. Hays commented on the reorganization of the federal government. His opinion at this time, when the final report on reorganization is about to be made, is regarded as being of much significance. Mr. Hays said in part:

"I would not presume to suggest, of course, the final detail of this effort, but it would seem natural to expect the creation of a Department of Public Works; the establishment of a Department of Public Welfare, independently or merged with labor, with which it is so intimately connected, to have charge of all bureaus and offices which handle relief work for the veterans of the war with Germany, including the Bureau of War Risk Insurance, the Federal Board for Vocational Education, hospitalization, the division of public health, and all those bureaus which would deal with health questions generally and with educational and social welfare; the stripping of the Treasury Department of all except its proper fiscal functions; the transfer of all non-military work from the War Department and the Navy Department to the regular civilian departments of the government; enlargement of the Department of Commerce and transfer to that department of all agencies which have to do with the promotion of commerce and the protection of navigation; establishment of a centralized purchasing agency to do the buying of all branches of the executive establishment; full functioning of the budget system, and altogether a reorganization which will bring a material reduction of the overhead expenses."

To Make New York Industrial Lighting Code Mandatory

HEARINGS will take place during the third week in December on the proposed rules of the industrial code, as amended, relating to lighting of factories and mercantile establishments in the State of New York. Hearings will be held in Buffalo on Dec. 13, in Rochester on Dec. 15, in Syracuse on Dec. 17 and in New York City on Dec. 21.

The table of intensities of all of the factories of the state is made mandatory instead of tentative as under the rules now in existence. Here and there intensities have been increased slightly. The rule relating to shading of lamps has been strengthened by specifying that the shades must be of non-inflammable material.

New York Supreme Court Declares Service Charge for Gas Illegal

IN THE case of the City of Rochester versus the Rochester Gas & Electric Corporation the Appellate Division, Third Department, of the Supreme Court of New York recently handed down a decision declaring illegal a service charge on bills to gas consumers. This decision is contrary to one rendered last spring and is based on Section 66 of the transportation corporation law, which provides: "No gaslight corporation in this state shall charge or collect rent for its gas meters either in a direct or indirect manner." No opinion was expressed by the court as to the equity of the charge, and it is interesting to note that two of the judges dissented from the decision, and in another case, that of the town of North Hempstead versus the Public Service Corporation of Long Island, the New York Supreme Court sustained the service charge. The cases have been referred to the Court of Appeals.

While the decision does not affect electric companies as the law applies only to gaslight corporations, considerable significance is attached to it. Frequently unsuccessful attempts have been made within the past few years to redraft the law to include electric companies.

Interconnection of New York Companies Is Urged at Empire State Meeting

AN INTERCONNECTING system for the companies of New York State and various production and distribution topics were discussed at a meeting of the Empire State Gas and Electric Association at Albany, N. Y., Nov. 17 and 18.

The interconnection project was advocated by E. P. Peck, general superintendent electrical department, Utica Gas & Electric Company, who pointed out that such an interconnection would reduce production costs and would enable a general enjoyment of the benefits to be received from the superpower system. As a practicable plan to accomplish this interconnection Mr. Peck suggested that on all new or revised construction equipment be installed which can be connected to trunk lines of suitable frequency and voltage for such a system. Although this frequency and voltage will have to be decided by the companies concerned, he suggested 60 cycles and 66,000 volts as most logical. As the load of practically every company lies within about a 50-mile radius, he thought that no higher voltage would be satisfactory. Sixty cycles, he stated, was becoming generally recognized as most suitable for ordinary transmission. One company, he said, was already buying new equipment for 60 cycles instead of its old frequency of 40 cycles. Transmission lines built now should be spaced for 66,000 volts and insulated for present voltage, while transformers should be purchased with 66,000-volt taps, according to Mr. Peck.

Such an "interpower" system, he claimed, would do as much good comparatively in New York as the superpower scheme will do for the larger territory it covers. It would cut down plant capacities necessary, as well as cutting down interruptions and low-water and high-water losses.

A symposium of operating practices of power companies having various combinations of steam and hydro-electric plants was given by engineers of the companies. A particularly interesting method of load dispatching was described by Mr. Hague of the Rochester Gas & Electric Corporation.

In a discussion of transformer loading it was stated that the Elmira Water, Light & Power Company disregards connected load, as it has found that the peak on nearly all transformers where no range loads are present is about 0.2 kva. per service to each customer (0.24 kva. on dark days). About 500 watts per customer is allowed in transformer rating.

J. K. Waterhouse, New York & Queens Electric Light & Power Company, said that to decrease the number of tree grounds on distribution lines his company used a certain twine-braid, rubber-covered wire which was cabled together with heavy twine for use in thick woods and used separately in thinner trees with hardwood molding where necessary.

Princeton Establishes New Engineering Lectureship

IN CONNECTION with the expansion of the engineering schools of Princeton University made possible by the Frick bequest and the university's endowment fund, the Cyrus Fogg Brackett lectureship in applied engineering technology has been established by the Princeton Engineering Association of New York City. The first lecture under these auspices will be delivered to the engineering faculty and undergraduates at Princeton on Dec. 1 by Samuel Insull, president of the Commonwealth Edison Company, Chicago, whose topic will be "The Production and Distribution of Electrical Energy in the Central Portion of the Mississippi Valley." Other lectures on public utility engineering and management will follow Mr. Insull's, and among the lecturers will be Charles L. Edgar, president of the Edison Electric Illuminating Company of Boston; John W. Lieb, vice-president of the New York Edison Company; Joseph B. McCall, president of the Philadelphia Electric Company; William C. L. Eglin, chief engineer of the Philadelphia Electric Company, and Herbert A. Wagner, president of the Consolidated Gas, Electric Light & Power Company of Baltimore, all of them past-presidents of the National Electric Light Association.

Mortgages on Memphis Gas & Electric Property to Be Foreclosed

PURSUANT to bills filed against the Memphis Gas & Electric Company in the interests of New York and Chicago controlling interests, foreclosure proceedings on mortgages of which payment was guaranteed by three bond issues of the Memphis utility company have been authorized in the United States District Court. The Memphis company has been in the hands of receivers for some time, and their control is continued by the court order. The bond issues on which interest is in default include one of the Memphis Gas & Electric Company for $20,000,000, of which $2,263,000 was sold; one of the Memphis Consolidated Gas & Electric Company for $10,000,000, of which $5,728,000 was sold, and one of the Merchants' Power Company. The last two companies were merged into the one first named.

The franchises of the Memphis Gas & Electric Company will be affected in no way by the action of the mortgagees, but local holders of the securities are likely to be heavy losers, and of such holders in the city and state there are said to be many. All the bills were

filed for the Central Union Trust Company of New York, representing the Brady interests of New York and the Billings interests of Chicago. The result of the foreclosure will probably be a sale at auction to the highest bidder, and there is thought to be little doubt that the metropolitan interests will bid the property in.

A. S. M. E. Will Discuss Heat Balance and Fuel Waste

POWER problems are to come in for a large share of attention at the annual meeting of the American Society of Mechanical Engineers, which will be held from Monday to Friday, Dec. 5-9, in the Engineering Societies Building, New York City. On Monday there will be a session on the elimination of waste in industry and an evening session on education and training in the industries.

The main feature on Tuesday will be a power waste session, which will take up the whole morning. It will be in the nature of a "heat-balance symposium" and will comprise four papers on the heat balance of the following stations: Connors Creek station of the Detroit Edison Company, by C. H. Berry and F. E. Moreton; Colfax station of the Duquesne Light Company, Pittsburgh, by C. W. E. Clarke; Delaware station of the Philadelphia Electric Company, by E. L. Hopping, and Hell Gate station of the United Electric Light & Power Company, New York, by J. H. Lawrence and W. M. Keenan. Simultaneously with the power waste session there will be a machine-shop waste session and a railway session.

Wednesday will be devoted to business. On Thursday morning four papers will be devoted to fuel waste as follows: "Boiler Plant Efficiency," by Victor J. Azbe; "Fuel Saving in Relation to Capital Necessary," by Joseph Harrington; "Developments in Boiler and Furnace Design," by D. S. Jacobus, and "Producer Gas for Industrial Furnaces," by W. B. Chapman. Papers on "Testing of Emergency Fleet Boilers Using Oil Fuel," by F. W. Dean, and "Steam Condensing Plants," by Paul A. Bancel, will be presented on Friday.

Basis of the New Orleans Settlement that Was Halted by Court

NEW ORLEANS newspapers publish what purport to be the principal points of the agreement reached by the conferees who had under advisement a settlement of the utility troubles in that city. This agreement, as reported in the ELECTRICAL WORLD for Nov. 19, page 1042, was halted by the continuing of an injunction from the Louisiana Supreme Court restraining the city from entering into any agreement with the New Orleans Railway & Light Company on car fares. In this plan, which its supporters still hope to make effective by inducing the state to drop its suit against the city, detailed provision is made for the financial readjustments that are necessary, though some points are still in dispute between the city and the company.

The outstanding underlying bonds are not to be distributed, and the outstanding 4½ per cen' general mortgage bonds, due July 1, 1935, are to be exchanged for 25 per cent cash and 75 per cent new general lien bonds, due July 1, 1935. The new 4½ per cent bonds are to have a preferred position in that they will rank after the new first and refunding open mortgage bonds. Two reserve funds are provided, and provision is made for the creation of a fund of $200,000, 50 per cent of which is to be used for betterments and improvements, and the remainder for purchase and retirement of the new 4½ per cent bonds at their lowest bid value.

No new securities are to be issued by the company without the consent of the Council, the city to have a perpetual option on the property of the company at the valuation stipulated as of Dec. 31, 1920, plus such additions as may have been made.

Electric light and power rates are, by the contemplated agreement, to remain unchanged for the test period of twelve months, and sufficient funds are to be provided the receiver by the security holders' committee for the purchase and installation of needed equipment for the electric light and power plants.

Committee on Electrolysis Report Is Compilation of Present-Day Knowledge

THE American Committee on Electrolysis has just issued its 1921 report, superseding its preliminary report of 1916, in book form. It is primarily a marshaling of the general and specific knowledge regarding the causes of electrolysis and methods of electrolysis mitigation, and in no way attempts to lay down specific recommendations as to best methods of preventing or mitigating electrolysis troubles.

From one angle, the book or report might be regarded as a complete text on electrolysis, and in a way it is so presented and arranged. A good synopsis of principles with definitions of terms is placed at the beginning of the report.

More than one-third of the 204 pages of the book are devoted to discussion of the design, construction, operation and maintenance of railways and of underground structures affected by electrolysis and to a discussion of measures involving the interconnection of affected structures and railways, ending with a summary of good practice as analyzed by the committee.

The other chapter headings in the book are "Electrolysis Surveys," "European Practice" and "Electrolysis Research."

The committee making this report is a joint committee of the following nine organizations, each having three members on the committee: American Institute of Electrical Engineers, American Electric Railway Association, American Railway Engineering Association, National Electric Light Association, American Gas Association, Natural Gas Association of America, American Telephone & Telegraph Company, American Water Works Association and the National Bureau of Standards. Bion J. Arnold is chairman.

Woman's Public Information Committee Appointees

MISS O. A. BURSIEL of Boston, secretary of the New England Division, National Electric Light Association, has been appointed chairman of the recently formed woman's public information committee of the Public Relations Section of the national association. Other members are Miss R. E. McKee, Middle West Utilities Company, Chicago; Mrs. Paul Rittenhouse, Northern States Power Company, Minneapolis; Miss Clotilde Grunsky, *Journal of Electricity and Western Industry*, San Francisco; Miss B. H. Lowrey, Henry L. Doherty & Company, New York, and Miss Clare Zillesson, Philadelphia Electric Company, Philadelphia.

Federal Power Commission Hears Protest of Electric Utilities and Others

THE National Electric Light Association made a vigorous protest to the Federal Power Commission at a hearing in Washington on Monday of this week against General Regulations 16 and 17, dealing with depreciation and amortization reserves. Appearing for the association were Milan R. Bump, president; Franklin T. Griffith, vice-president and chairman of the water-power committee; S. Z. Mitchell, H. G. Bradlee, Guy E. Tripp and O. D. Young of the public policy committee; W. E. Robertson of the executive committee; H. M. Edwards, chairman of a special accounting committee; W. J. Myers, chairman of the committee on uniform classification of accounts; Guy W. Talbot, president of the Pacific Power & Light Company; Thomas Martin, president of the Alabama Power Company; H. J. Pierce, president of the Washington Irrigation & Improvement Company; Gen. George H. Harries, Dennis T. Flynn and F. W. Stehr of H. M. Byllesby & Company; W. Paxton Little of the Niagara Falls Power Company, W. C. Lang of the Electric Bond & Share Company, G. F. Nevins of the Pacific Power & Light Company, and George F. Oxley and Fred Herbert of the association's headquarters staff. Dr. William McClellan appeared for the American Institute of Electrical Engineers and Colonel Hugh Cooper for the consulting engineers. The Investment Bankers' Association sent as its spokesman H. M. Addinsell of Harris, Forbes & Company, chairman of its public utility securities committee. Oscar Fogg, executive manager of the American Gas Association, and R. A. Carter, chairman of its rate fundamentals committee; H. M. Brundage of the Empire State Gas & Electric Association, and W. H. Onken, Jr., editor of the ELECTRICAL WORLD, were also in attendance.

The manufacturers of electrical apparatus and of waterwheels sent a strong delegation, which included, besides Guy E. Tripp of the Westinghouse Electric & Manufacturing Company and O. D. Young of the General Electric Company, W. W. Nichols of the Allis-Chalmers Manufacturing Company, C. Elmer Smith of the S. Morgan Smith Company, W. D. Ward of the Pelton Water Wheel Company, Edwin S. Church of the Wellman-Seaver-Morgan Company, H. B. Taylor of the I. P. Morris department of the William Cramp & Sons Ship & Engine Building Company, and A. F. Sparks of James Leffell & Company. The Electrical Supply Jobbers' Association was represented by W. E. Robertson of Buffalo.

INDUSTRY ANXIOUS TO PROCEED

Objection was made to the principle and theory of depreciation embodied in Regulation 16, the National Electric Light Association maintaining that this regulation is economically unsound and not required by the provisions of the water-power act. A recasting of the regulation was suggested so as to eliminate the life-table method and to substitute therefor a proviso that depreciation reserves shall be maintained by the licensee sufficient to keep the project in a condition of repair adequate for efficient operation by providing for necessary renewals and replacements when made. With reference to Regulation 17 it was again urged by the association that in effect it penalizes the conservatively financed licensee and puts a premium on the unsoundly or extravagantly financed licensee. Statements were filed by M. R. Bump, Franklin T. Griffith, H. J. Pierce, H. M. Addinsell, H. M. Edwards, W. J. Myers and O. D. Young.

In his opening address at the hearing President Bump outlined the objections to the regulations and expressed the hope that the restrictions would be removed. He said the water-power act was created to stop an enormous national waste; to promote and make possible the development of the water resources of the country, to render these resources quickly available to the general public. From the standpoint of conservation of the coal and fuel supplies, the re-employment of labor and the reclamation of desert lands, the act is of vast importance. He believed that the machinery set up under the act governing the granting of permits and carrying out the terms imposed by the act did not and does not contemplate the interpretation placed upon the act nor did it contemplate the harmful regulations which the staff now proposes. The act, he said, limits the making of rules and regulations to such as are not in conflict with the act, and he held that the proposed rules and regulations are in conflict with the act because, among other things, their effect is to defeat its purpose.

A careful survey of the entire electrical industry indicates the need for an expenditure of $1,000,000,000 annually over the next five years, a large portion of which is dependent upon water-power development. Mr. Bump said that the industry stands ready to proceed today with the largest program of development in its history, provided that the water-power act is interpreted in a constructive way in accordance with both its spirit and letter so that the financing of these improvements will be made possible.

OBJECTIONS TO TENTATIVE CLASSIFICATION

Franklin Griffith, speaking for the water-power committee, likened the differences of opinion which existed between the utilities and the commission as the difference between practice and theory. Under the provisions of Regulation 16, he said, a reserve is required to maintain 100 per cent of physical value based upon theoretical depreciation of the units of the project property, founded upon estimates of the operating life of such units, which estimates are guesses and necessarily inaccurate. In practical operation, he said there is no necessity for the gradual accumulation in a depreciation reserve account of a large credit balance in excess of that required for the actual renewals and replacements as made. Moreover, he declared. the regulation does not take into account the vicissitudes of the business, nor the necessity of safeguarding the financial structure of the project, which, if disregarded, would make it impossible to maintain and expand the physical structure.

It was pointed out by Mr. Griffith that a licensee's credit and power to obtain investment funds for expansion depends upon its ability to make a regular return upon the investment in its securities. It would therefore be a cruel and disastrous rule which required investors to forego a return upon their legitimate investment in order to enable a licensee to build up in a depreciation reserve a fund not required for actual renewals and replacements. He did not contend that no depreciation should be provided, but that the depreciation reserve should be only such as would be necessary to maintain the project works in efficient operation. The plan which he suggested was that adopted by the National Association of Railway and Utility Commissioners, and a recasting of Regulation 16 was submitted in conformity with these regulations. As for the amortization reserve, Mr. Griffith suggested that none would be

created unless and until the licensee shall have received a minimum definite return of at least 10 per cent. This, in exceptional cases, might be increased, depending upon the hazard involved.

ECONOMIC FEATURES OF DEPRECIATION

The brief of H. M. Edwards was devoted entirely to proving that the straight-line theory on depreciation bases on life tables, which Regulation 16 prescribes, is wrong and unsound because it is contrary to the facts of the business. Mr. Edwards also showed that the alternate plan recommended by the National Electric Light Association not only conformed with the requirements of the act but also adhered to the facts of the business. His contention was that the regulation as now worded attempts to force into the utilities' books and accounts mere matters of opinion, estimate or conjecture, whereas books and accounts should reflect only facts and the actualities of the business. The regulation requires that a reserve should be created against every unit in service, beginning six months after installation, whether it is to be ultimately retired or not. Such reserves against units remaining in service inflate the cost of operation and are not in fact reserves for depreciation, but are provisions for the amortization of the investment. The method outlined by the National Electric Light Association for meeting the requirements of the act as regards depreciation reserves represents, Mr. Edwards maintained, the matured opinion of the entire central-station industry of the country and is the method followed by the great bulk of the individual corporations engaged in the business. They are similar to those adopted by the National Association of Railway and Utility Commissioners, which system was adopted after long conference with all types of public utilities.

W. J. Myers filed a memorandum objecting to the form of annual report required by the commission, which he said called for much information beyond the scope of the federal water-power act. He suggested that the annual report might be confined to four pages, one for the annual income account, the next two for a comparative balance sheet, and the fourth for such statistics as the commission legitimately needs to gather.

THE INTENT OF CONGRESS

H. J. Pierce, who was in Washington from 1913 until the water-power act was enacted in June, 1920, reviewed his impressions of how Congress intended the act to be interpreted and administered. He said that Congress did not intend the Federal Power Commission to be a regulatory body, nor did it expect that the commission would adopt such drastic and restrictive regulations as those proposed by the staff. This, he said, was indicated by the appropriation of $100,000 to administer the act, a sum which the next Congress refused to increase. His impression was that Congress intended that the act should be simply administrative and that regulation should be left to the states. In his opinion the regulations as adopted by the commission are too restrictive and technical and tend to destroy the entire benefits of the act.

H. M. Addinsell of Harris, Forbes & Company, in referring to Regulation 17, said the simpler and clearer the regulations are made, having in mind the protection of the consumers, the government and the security holders, the better it will be for all concerned. If, he said, we are to go forward on the vast program of development of water powers that economists and students of the affairs of our country had hoped would be made possible by the enactment of the federal water-power act, we must necessarily make the financing of those water powers and the resulting securities attractive to the investment public. There is no great central reservoir of capital waiting to be invested in these enterprises. A rate of return, before amortization sets in, of at least 10 per cent in any case should meet this objection to the present regulation. It should be borne in mind, he said, that the rate of return under discussion is, moreover, merely permissive and not guaranteed. It imposes a limitation on maximum profits, but gives no insurance as to any minimum return.

THE VIEWPOINT OF THE MANUFACTURERS

O. D. Young, vice-president of the General Electric Company, acted as the spokesman for the various manufacturing interests represented. He made no pretensions, he said, to understand the various theories of depreciation involved, but was willing to abide by the judgment of those who are purchasers of equipment. His recent visit to Germany indicated that the large electrical manufacturing companies there were working 100 per cent on electrical apparatus and supplies intended not only for German consumption but for export to the Scandinavian countries and to Italy. The same condition, he said, prevailed in Japan, which he also recently visited. Mr. Young contrasted this condition of affairs with that existing in this country, where the manufacturers are operating only about 25 per cent of their capacity. Inquiry, he said, revealed that the hydro-electric construction program was being retarded because of differences over Regulations 16 and 17. He hoped, therefore, it would be possible to reconcile these differences so that the utility companies would be enabled to finance new developments and place orders with the manufacturers of waterwheels and electrical machinery. This, he maintained, would go a long way toward solving the unemployment problem which now confronts the industry and would permit the country to take its proper place in catering to the larger needs of the world.

No decision was reached by the commission on the questions involved, but the expectation is that after a perusal of the briefs some modification would be made in Regulations 16 and 17.

Pennsylvania Edison Reached Its Maximum Output in October

THE highest hourly peak load ever reached on the Pennsylvania Edison Company system, which supplies the city of Easton and other places, was carried during the month of October, when it rose to 17,330 kw. That this was not merely a momentary demand, but was an indication of an improvement in industrial conditions, is shown by the fact that the kilowatt-hour output for the month was also the highest recorded in the history of the company. The figure, 8,108,270 kw.hr., was more than 500,000 kw.hr. above the total for the previous month, which was 7,538,750 kw.-hr.—up to that time the highest.

These encouraging records were made notwithstanding the fact that the largest of the power customers are using less energy than in normal times. The increase is thus due to the large number of new customers taken on during the past year and the fact that many of the smaller communities are using an increasing amount of energy.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Electric Yacht on Pacific.—The first electrically driven yacht built on the Pacific Ocean is under construction at Los Angeles for Capt. G. Allen Hancock, oil operator. It will have a cruising radius of 6,000 miles and when completed next summer will go on a cruise of the South Seas.

New Municipal Plant in Ohio.—Following discontinuance of the Springfield, Troy and Piqua traction service because of financial troubles, the village of North Hampton, Ohio, found itself cut off from electric light and power service. The village has in consequence just installed a municipal plant supplying street, residence and business service at 110 volts.

University of Toronto Opens New Electrical Building.—The new electrical building of the University of Toronto, Canada, which was in partial use last session, has been completed and was formally opened on Nov. 4 in connection with the annual reunion of the Engineering Alumni Association of the university. The new building, which forms a group with the mining and mechanical engineering buildings, is 225 ft. x 68 ft. in area. Two-thirds of the space is occupied by the department of electrical engineering and one-third by the departments of civil engineering and applied mechanics.

How Norwegian Hydro-Electric Company Avoids Pipe Lines on Hillside.—The disfigurement of the scenery by exposed pipe lines on the hillside has been obviated by one of Norway's newest hydro-electric systems—that at Herlandsfossen. Here the water is conveyed from the service reservoir to the turbines by an unlined pressure tunnel the static head of which at its lower end is 450 ft. This, *Engineering* believes, is by far the highest head for which an unlined tunnel has been devised in Europe, if not in the world. From the foot of this tunnel the pipe lines run through a horizontal tunnel to the power house. The power produced is used mainly for lighting and general purposes in the neighboring towns and villages. The power station has been built for a maximum capacity of 14,000 hp.

Grand Opera by Wireless.—The possibilities of wireless telephony were once more demonstrated recently in Chicago when Edith Mason, lyric soprano of the Chicago Grand Opera Company, from the Auditorium Theater sang to 50,000 persons in Kansas City, Minneapolis, Cincinnati, Pittsburgh and intermediate points. The test was made under actual opera conditions and consisted of an opening address by Mary Garden, an orchestra selection and Miss Mason's solo. High up in the wings of the theater, almost out of sight of the audience, a small instrument caught the music of the orchestra and the voice of the singer and carried them by wire to the roof of the Commonwealth Edison Company, where they were transmitted to 50,000 receiving instruments. For days a notice of the test had been going out over the wireless to the operators within a radius of 1,000 miles, and when the announcement, "This is station KYW, Chicago," was sent, all were "listening in." The Westinghouse Electric & Manufacturing Company, which is conducting this work, has also broadcasted on a 360-meter wave length, without relaying, entire operas and will continue to do so during the season.

More Electric Steam Boilers.—For some time past there have been in operation in Italy, Switzerland and France boilers in which the steam is generated by the passage of electric current through the water they contain. *Le Génie Civil* describes a large boiler—one of two working on this principle—which is of the Bergeon-Frédet type and which has been supplied by the Etablissements Joya of Grenoble to paper works at Brignoud, in the Department of Isère. Actually the installation at the works comprises three of these electric steam boilers, but one of them is only half the size of the others and was laid down experimentally. The results obtained with it were, however, so successful that the two larger boilers, each of which is sufficiently large to absorb 3,500 kw. of electrical energy, were ordered.

Electrification of London Railway.—A comprehensive scheme for the electrification of the London suburban lines of the Southeastern & Chatham Railway is reported in the *Electrician*. The scheme embraces the lines within a radius of about 30 miles from Charing Cross. Section A of the route has a mileage of 94 and Section B a mileage of 140. It is hoped to gain government aid and to proceed with the work of electrification by three stages. Increased speed and service will be the great advantages. The equipment will be of the direct-current third-rail type, supplying energy to the train motors at 1,500 volts from substations which will receive and convert high-tension alternating current. Rolling stock will be of the motor-car type with multiple-unit control. Two motor coaches and one trailer coach will constitute a unit, and trains of three, six or nine coaches, accommodating 256, 512 and 768 passengers respectively, will be run.

New Indiana System Developed.—An order just issued by the Indiana Public Service Commission to the Browne-Mills Electric Company of North Manchester reveals the development of a small electric system in northern Indiana by the Bippus interests of Huntington. In petitioning for relief from part of a previous order, the Browne-Mills company told the commission that the Bippus interests have already built an electric transmission line from Huntington, where they have a private electric plant, to Goblesville and to Bippus, nearby places. The Bippus Utilities Company is being formed. By January or February, the Browne-Mills petition said, the new company will have connected the North Manchester system, now operated by the Browne-Mills Company, with Bippus lines, which now are within about 5 miles of North Manchester. Because of this fact the Browne-Mills company requested the commission to relieve it from certain improvements which the commission ordered should be made in the North Manchester service.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

New York Electrical Society.—Dr. Charles P. Steinmetz spoke on "Long-Distance Power Transmission" before the meeting of this society on Nov. 25.

Institute Section Meetings.—Section meetings of the A. I. E. E. for next week are scheduled as follows: Nov. 28, Minnesota, "Theory of the Vacuum Tube and Its Engineering Applications," by C. M. Jansky, Jr.; Nov. 30, Atlanta, "Waterwheels"; Dec. 2, Schenectady, "The Superpower System," by W. S. Murray; Dec. 2, Providence, "Recent Developments in Electrolysis Testing," by E. R. Shephard.

St. Louis Electrical Board of Trade.—The executive committee of this organization has voted to hold an electric show in St. Louis during the spring of 1922. A preliminary committee to canvass the trade reported that 60 per cent of the space was spoken for by St. Louis firms in the course of ten days' work. This committee was composed of E. J. Spencer (chairman), C. E. Michel, F. A. Rick, L. F. Philo, J. J. Roche, H. T. Bussmann and A. C. Brandt.

Worcester A. I. E. E. Section Forms Program.—The Worcester (Mass.) Section of the American Institute of Electrical Engineers has planned the following program for this year's meetings under the chairmanship of George M. Hardy, superintendent of distribution for the Worcester Electric Light Company: Dec. 15, "Meters," by A. R. Rutter, meter engineer with the Westinghouse Electric & Manufacturing Company; Jan. 19, 1922, "Electric Traction," by W. S. Murray, consulting engineer, New York City; Feb. 16, paper on "Telephony," speaker to be announced; March 16, ladies' night, "Electrical Household Appliances"; April 20, prize competition paper by local member; May 18, annual meeting.

Coming Meetings of Electrical and Other Technical Societies

A. I. E. E. Section Meetings—Minnesota, Nov. 28; Atlanta, Nov. 30; Providence, Dec. 2; Baltimore, Dec. 8; New York, Dec. 14.

A. I. and S. E. E.—Cleveland Section, Dec. 12; Chicago Section, Dec. 16; Pittsburgh Section, Dec. 19; Philadelphia Section, Dec. 20.

Electrical Supply Jobbers' Association—Cleveland, Nov. 30, Dec. 1-2. Atlantic Division, Cleveland, Nov. 29.

American Society of Mechanical Engineers—New York, Dec. 5-9.

American Society of Refrigerating Engineers—New York, Dec. 5-7.

American Institute of Chemical Engineers—Baltimore, Dec. 6-9.

American Physical Society—Toronto, Dec. 27-30.

American Association for the Advancement of Science—Toronto, Dec. 27-31.

American Engineering Council — Washington, Jan. 5-6.

Western Association of Electrical Inspectors—Chicago, Jan. 17-19.

American Society of Civil Engineers—New York, Jan. 18-19.

Lighting Fixture Dealers' Society of America—Milwaukee, Jan. 30-Feb. 2.

National Meter Committee, N. E. L. A.—Springfield, Ill., Feb. 15.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Relative Weight of Observation and of Scientific Measurement in Assessing Damages from Overflow.—Holcomb vs. Alpena Power Company was a suit arising because of the overflowing of part of plaintiff's farm on account of a dam maintained by the power company. The plaintiff's original suit for an injunction forbidding the maintenance of the dam had been denied, but damages had been awarded to him, and against these the power company appealed to the Supreme Court of Michigan. This court found the award excessive, reducing it from $6,555 to $3,820. In estimating the relative weight of conflicting testimony the court said: "The law is well settled in this state, as well as elsewhere, that tests from observation and experience are competent evidence against scientific measurements and theories and often more satisfactory when the two are brought into conflict." (184 N. W. 587.)*

The Fourteenth Amendment Applied to the Public Service Railway Company of New Jersey.—In Public Service Railway Company vs. Board of Public Utility Commissioners of New Jersey an application was made to the United States Circuit Court of Appeals against decisions of the commission on the ground that these decisions involved confiscation. The court in granting a temporary injunction against the commission's order of July 14 made it contingent upon a certain rate of fare not being exceeded during the pendency of the injunction. The grounds for overruling the commission's decision were that the board had underestimated or wholly excluded from its valuation certain of the company's properties, that the rates fixed by the board provided no return for the service of the properties excluded, and that the rates fixed were to that extent confiscatory and therefore in conflict with the Fourteenth Amendment of the Constitution.

Purchasing Company Not Bound by an Original Contract Subsequently Modified.—In City of Albany vs. Georgia-Alabama Power Company the city sought to have the company enjoined from cutting off the energy furnished the city under contract, the city alleging that the company wrongfully demanded immediate payment of a bill greatly in excess of the amount justly owed it by the city. The company predicated its claim upon an alleged contract subsequent to the original one between the city and the Albany Power & Manufacturing Company, which the defendant company had succeeded. In affirming judgment for the defendant the Supreme Court of Georgia held that the purchasing corporation was not bound to fulfill the terms of the original contract and was not estopped from asserting that if it was bound by any contract it was the one under which it had operated from the time of its purchase of the property of the first corporation up to the time that the controversy had its origin. (108 S. E. 528.)

Company's Control of Appliances Not an Inference from Rules Printed on Back of Contract.—On a rehearing of McTerran vs. Merchants' Heat & Light Company (see ELECTRICAL WORLD, Aug. 27, page 438), the Appellate Court of Indiana, which had found the defendant company not liable because of an electrical injury causing death, the court holding that the company did not own or control and therefore was not responsible for the defective apparatus to which the injury was due, refused to amend its former decision. Counsel urged that certain statements printed on the back of the sheet of paper on the face of which the contract was written constituted evidence from which the jurors might have concluded the company did control the apparatus in question, the contract being made "subject to the rules and regulations printed on the back" and something being said in these rules and regulations about appliances "installed in the premises by the company at its expense." The Appellate Court found no evidence whatever to bear out counsel's supposition, it having been conceded that the company did nothing more than connect its wire to the customer's switchboard. (132 N. E. 267.)

Pennsylvania Supreme Court on Police Power.—In reversing an order of the Public Service Commission of Pennsylvania for a reduction of tolls charged by a Bethlehem bridge-owning coporation to a street railway (New-Street Bridge Company vs. Commission), the Pennsylvania Supreme Court made these observations on police power: "It seems the growing tendency is to broaden the scope of the police power; it is now out of the question to hazard a definition of it, or even to decide that action such as indicated may not be declared a lawful exercise of this power. Judges in other days said it was for the benefit of the common weal, in furtherance of morality, health, safety, general prosperity and the like; but it is growing to be regarded by some more as the handmaid of socialism, without reference to any of the great fundamental principles on which organized society rests. The justification for the exercise of police power over these companies and their contracts was that their business occupied a peculiar position on the highways of the commonwealth, interwoven with the public life and of a nature essentially monopolistic in character, compelling the public to be their customer whether it would or not. They operated under charters and laws with certain governmental powers not given to ordinary companies. Indispensably creatures of the state, they dealt with the public directly and the public had to deal with them. As to the extent of regulation, this court has consistently held that neither the commission nor the Legislature could enter the field of public service activity unless it was for the benefit of the public generally, and then only after a fair return was made to the company, or, in other words, in the application of the police power confiscation could not take place." (114 At. 378.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Recorder System.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Contract for Sale of Bonds Is Modified.—The practice of some California utilities of entering into a contract for the sale of bonds, subject to the approval of the Railroad Commission, encountered a snag when the commission modified the terms of an issue of $1,000,000 of 7 per cent bonds sought by the Southern California Gas Company. The utility on Sept. 26 had made a contract to sell this issue at 93½ per cent of its face value, plus accrued interest, and filed its application with the commission on Oct. 10. The matter was heard and submitted on Oct. 28. In the meantime, the commission pointed out, the bond market had improved, and the commission's order directed the company to sell the bonds at not less than 95 per cent net and accrued interest, without the payment of any commission or brokerage. The commission announced that it will be governed by market conditions as they exist at the time it passes on an issue of securities, and not by the market conditions as they existed at the time any contract to sell bonds was made.

Regulation of Off-Peak Service.—Canceling proposed limited-hour rate schedules of the Commonwealth Edison Company and substituting others as a result of complaint against the company's charges by a number of industrial companies, the Illinois Commerce Commission laid down the following principles as governing ones in the cases at issue: (1) The Illinois Commerce Commission has full authority over all public utility rates regardless of the fact that they may have been the subject of private agreement; (2) the failure of an electric company rendering service at reduced rates during off-peak hours to enforce restrictions on service is not a waiver of the right to enforce such restrictions; (3) an electric company should not be allowed to insert in a rate schedule for off-peak service a provision that when a consumer exceeds the allowable demand at the time of the peak hours he shall be billed for unrestricted service from the date of the contract or from the effective date of the schedule; (4) it is proper to include in an electric rate schedule for off-peak service a provision for placing a limited-hour consumer on the regular rate from the beginning of any month in which his demand first exceeds that permitted in the limited-hour rate contract; (5) it is proper to include in a rate schedule for off-peak electric service a provision that in case a consumer who has been changed from the limited-hour rate to the regular rate, after exceeding the allowable maximum demand, shall again elect to substitute the limited-hour rate and then shall again exceed the allowable minimum, he shall be billed retroactively under the regular rates to the beginning of the peak period then existing.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

Charles E. Gurney has been appointed chairman of the Maine Public Utilities Commission, succeeding B. F. Cleaves, who resigned recently to become secretary of the Associated Industries of

C. E. GURNEY

Maine. Mr. Gurney's nomination was unanimously confirmed by the Governor's Council Oct. 29, and he has entered upon his duties, with headquarters at Augusta. The new chairman was born at Portland, Me., forty-six years ago, and since his graduation from Colby College, in 1898, he has been engaged in legal practice. In 1917 he was a member of the Maine House of Representatives, and he was elected from Cumberland County to the State Senate for the sessions of 1919 and 1921. Upon the assumption of the governorship by Percival P. Baxter, following the death of the late Governor Parkhurst, Mr. Gurney was elected president of the Maine Senate, and he filled that office until his appointment as head of the Maine commission. To a representative of the ELECTRICAL WORLD Chairman Gurney said that it is his belief that the most valuable asset of a public utility is the confidence, good will and support of its patrons; that there is no deadline with public utilities on the one side and people on the other, and that honest and impartial regulatory policies must be mindful of the fact that along with their application should go a recognition of the fact that the money of the citizens is invested in these utilities.

Henry K. McIntyre, formerly associate professor of electrical engineering at the North Carolina State College of Agriculture and Engineering, West Raleigh, N. C., has been made full professor of electrical applications. George C. Cox, formerly instructor, has been made assistant professor of electrical engineering. William Hand Brown, Jr., remains professor in charge of the department.

R. Joel Andrus, until recently operating engineer of the Central Power Company at Grand Island, Neb., has been transferred to the engineering department of the Middle West Utilities Company in Chicago. Mr. Andrus is a graduate of the electrical engineering department of the University of Minnesota, 1907. He was with the Washington Water Power Company from 1907 to 1909 and district manager for the Pacific Power & Light Company in the Pasco-Kennewick district in Washington from 1909 to 1912. From 1912 to 1916 he was vice-president and general manager of the Northwest Electric & Waterworks Company at Seattle. He was the general manager of the Indiana Water & Power Company at Bloomfield, Ind., in 1916 and 1917 and has been with the Insull properties in Nebraska from that time to the present.

E. M. Walker, who was elected president of the Indiana Electric Light Association at the recent French Lick Springs convention, is president of the Terre Haute & Western Railway, which operates in Illinois as well as Indiana. For a number of years he was connected with the combined electric light and gas business and later had the duty of managing a gas, electric and street-railway business. Up to 1912 he was with the utility properties at Muscatine, Iowa. From 1912 to 1917 he was in charge of the electric light and street railway properties at Dubuque, Iowa, resigning in 1917 to go to Terre Haute, Ind., as the general manager of the company. He was

E. M. WALKER

president of the Iowa Electric Light Association for the year 1916-1917 and for the past year president of the Illinois Electric Railways Association. Mr. Walker is a native of England, having come to this country in 1887. He was graduated from Williams College in 1897.

Arthur S. Blair has been appointed assistant superintendent of the general service department of the Edison Electric Illuminating Company of Boston. Mr. Blair entered the company's service in 1896 and was employed for a time in the generating department. He resigned in 1897, but re-entered the organization in 1903 as a test man in the laboratory, later becoming chief clerk and ultimately head of the office division, which post he occupied at the time of his latest appointment.

Charles K. Nichols, who has been appointed chairman of the Power Sales Bureau, Commercial National Section, N. E. L. A., is general power agent of the New York Edison Company. After

C. K. NICHOLS

leaving Pratt Institute in Brooklyn Mr. Nichols took up special work in industrial and works engineering in the Brooklyn Polytechnic Institute and then spent three years in practical work in New England textile mills. In 1902 he entered the service of the New York Edison Company and after filling several positions in the commercial department was placed in charge of the then newly organized power bureau. Since then he has handled all of the commercial power work for the company. Mr. Nichols has served as member of the industrial power committee of the A. I. E. E. and has long been identified with the activities of the N. E. L. A. both in the national body and in the New York Companies' Section. In the New York section he has been a member of the executive committee for several years. He was one of the original members of the Power Sales Bureau of the Commercial National Section, serving for two years as its vice-chairman.

Prof. Alexander J. Wurtz, who has been in charge of the department of electrical engineering of the Carnegie Institute of Technology since the opening of the institute in 1905, has been named research professor in the new research division of the institute and will give the major portion of his time to this field of work, though he will still give one or two courses in the electrical engineering department. William R. Work, associate professor, who has also been in the department about fifteen years, has been promoted to professor and acting head of the department of electrical engineering, thus taking over the administrative work formerly handled by Professor Wurtz.

Harold B. Fisk, who was recently appointed manager of the Walsh Plate & Structural Works, Ltd., at Drummondville, Quebec, was born in England in 1885. He was educated at a grammar school and Kings College, London. After serving as a pupil with Baily, Grundy & Barrett, a firm of mechanical and electrical engineers, at Cambridge, England, he went to Canada in 1907, entering the service of the Shawinigan Water & Power Company as operator in the Montreal terminal station and being soon transferred to the head office of the company in Montreal. Mr.

H. B. FISK

Fisk has also seen service with the British Canadian Power Company, now the Northern Ontario Power Company, Ltd., at Cobalt, being assistant to the general superintendent and afterward superintendent of the Matabitchouan River power development. He has been connected with the Toronto Power Company at London, Ont. and the Kaministiquia Power Company at Fort William, Ont. The period from 1916 to his present appointment he spent with the Southern Canada Power Company as superintendent of the Drummondville division. Mr. Fisk became a member of the A. I. E. E. in August, 1919.

Guy Barker, formerly in the engineering department of the Pacific Gas & Electric Company, is now associated with the H. W. Johns-Manville Company as electrical specialist, with headquarters in San Francisco.

Emory M. Coffin, formerly sales manager of the Pierce Fuse Corporation, Buffalo, and **B. F. Perry,** formerly district manager of the same company, have announced their resignation in order to form the Coffin-Perry Company, with headquarters at Columbus, Ohio. The new company will represent well-known electrical manufacturers in West Virginia, western Pennsylvania, Ohio and Kentucky.

N. I. Allen, for the past ten years connected with the Western Electric Company, Inc., has resigned as sales manager of the Providence (R. I.) branch and has become sales manager of W. A. Huse & Son, consulting electrical engineers and contractors, 128 Empire Street, Providence. The lighting and household-appliance departments of the organization will be placed under the personal supervision of Mr. Allen.

T. M. Orchard has been appointed production manager of the Hygrade Lamp Company, Salem, Mass., succeeding A. B. Stetson, who severed his connection with the company Nov. 1 to enter another line of business. Mr. Orchard is a graduate of Bucknell University and of the Massachusetts Institute of Technology, and has been on the staff of the Hygrade company about a year. Mr. Stetson entered the company's service in 1916 after a successful career with the General Electric and Westinghouse companies .

D. K. Chadbourne has been appointed manager of the New York office of the Westinghouse Electric International Company. Mr. Chadbourne went to the Westinghouse company from the George Cutter Company in 1920, before the latter was affiliated with the Westinghouse organization, having served successively as Western district manager and Eastern district manager of the George Cutter Company for eight years, beginning in 1912. Before becoming connected with the Cutter interests he spent six years with the Allis-Chalmers Company. Mr. Chadbourne was graduated from Purdue University in 1906.

Frank M. Germane, known throughout the automotive and allied industries through his years of association with manufacturers' distribution of ball bearings, has resigned as director and sales manager of the Marlin-Rockwell group. Mr. Germane joined the old Standard Roller Bearing Company in 1903 as Western sales manager in Chicago, covering all the manufacturing plants from Buffalo west. Two years later he went to the Philadelphia factory as sales manager and became successively general manager and vice-president, when the company was absorbed by the Marlin-Rockwell interests.

Charles P. Cushway has been appointed manager of the cable and specialties department of the Belden Manufacturing Company. Mr. Cushway joined this company in 1918 and since then has served as junior and senior engineer and as assistant chief

C. P. CUSHWAY

engineer. Previous to this he had been with the Commonwealth Edison Company in its meter-testing department. Mr. Cushway received his education at the Crane Technical High School and in the electrical engineering course at the Armour Institute of Technology.

Obituary

Leon H. Scherck, general sales manager of the Central Hudson Gas & Electric Company, Poughkeepsie, N. Y., died suddenly on Nov. 16, of angina pectoris. Mr. Scherck was born at New Orleans in 1876. He was graduated from Tulane University of New Orleans. Soon after graduation he was asso-

L. H. SCHERCK

ciated with Isadore Newman & Sons, bankers of New Orleans, and later with Ford, Bacon & Davis, engineers of New York City. In 1909 he became general sales manager of the Central Hudson Gas & Electric Company, which position he held at the time of his death. Mr. Scherck was nationally known as an authority on matters dealing with public utility sales. He was also largely interested in local affairs and was president of the Poughkeepsie Chamber of Commerce during the year 1917.

Prof. Charles R. Cross, for forty-three years actively connected with the Massachusetts Institute of Technology and because of whose foresight and zeal the institute offered the first degree given in an electrical engineering course in the United States, died Nov. 16 at his home in Brookline, Mass. Professor Cross was born at Troy, N. Y., in 1848. He was graduated from the Massachusetts Institute of Technology in 1870 and in 1871 became an assistant in physics. After seven years' service he was appointed professor of physics, and in 1886 he became director of the Rogers Laboratory, which post he held until a few years ago, when he retired with the title of professor emeritus. The inclusion of electrical studies in the physics courses and their later extension into an electrical engineering curriculum at the institute was largely due to Professor Cross's recognition of the increasing importance of electrical applications in civilized life. He was an authority on sound and played an important part in telephonic development. As a teacher he was noted for his pioneer vision, thoroughness of work and devotion to the highest standards of student training. In the days when the institute itself was largely an experiment Professor Cross's self-sacrificing service was no small factor in its success.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Electrical Sheet Firm in Unsteady Steel Market

PIPE and tubular goods seem to be the most favored of iron and steel products at the present time, and they are barely holding their own. Steel sheets are sagging consistently, though it was only a little over a month ago that a number of independent sheet makers notified their customers of a five-dollar-per-ton increase in sheet prices which brought quotations to 3.25 cents on black, 2.75 cents on blue annealed and 4.25 cents on galvanized on Oct. 15. These quotations endured for some time, but in the last two weeks weakness has developed, and sheets may now be obtained from several sources for 2.75, 2.25 and 3.75 cents for black, blue annealed and galvanized respectively.

Production of sheets is still fairly high, some mills running as high as 80 to 85 per cent of capacity, though the general average for steel products is only around 50 per cent. The output of electrical sheet still remains low, however, and producers have their stocks well ahead of demand. Buying is considerably better than a month ago. Then even inquiries were somewhat scarce. Transformer manufacturers are coming into the market more boldly, and one producer is said to have obtained several good orders for electrical sheet from this source. Motor manufacturers apparently are out of the electrical sheet market, though it is felt that the movement of popular-size motors will encourage them to come into the market for raw materials soon. The prices of electrical sheet have not been affected either by the two increases on ordinary sheets put into effect Sept. 15 and Oct. 15 respectively or by the weakness of the present market.

October Electrical Exports Show Moderate Increase Over September

ELECTRICAL exports for October, 1921, are valued at $4,970,332, showing an increase over the preceding month this year of $91,449, or less than 2 per cent. However, as compared with October, 1920, there was a loss of $5,007,883, or approximately 100 per cent. This decrease would be startling if it were not for the fact that many of the items listed have decreased in money value from 25 to 30 per cent during the twelve months that have elapsed. That exports have shown even a slight upward turn, however, is taken for a sign of encouragement, and there is hope that the bottom of the curve, which has been going down since March of this year, has been reached. September was the lowest month this year, and the previous lowest month, August, is still ahead of October in value of exports.

The value of exports for the year to date is still considerably ahead of that for the first ten months of 1920, and it may be taken for granted that the volume is far ahead. The total value up to Nov. 1, 1921, is $86,143,034, while that for the corresponding period in the previous year is only $78,318,655. However, it is doubtful whether the end of the year will see this ratio still good, as at the present rate last year will eclipse this by several million dollars. Under the present conditions in the export field the fact that the current year's total will come so close to that of 1920 may be taken hopefully.

Only seven articles show decreases for this ten-month period, including batteries, carbons, interior wiring supplies, arc lamps, metal-filament lamps, magnetos and rheostats and controllers. The most important decrease was on batteries, amounting to $1,898,980, or approximately 56 per cent of total exports of this item for 1921 to date. Excluding the miscellaneous classification, eleven totals show increases, some of the more important being dynamos and generators, insulated wire and cable, motors, telephones and transformers. Transformers continue to hold the lead in percentage of increase, being almost exactly 100 per cent ahead of last year, with a total of $7,444,257.

A comparison of October and September of this year

			Nine Months Ended October	
	Oct., 1920	Oct., 1921	1920	1921
Batteries	$483,109	$211,758	$5,368,371	$3,469,391
Carbons	137,760	26,526	1,223,591	373,832
Dynamos and generators	970,840	779,338	5,625,877	6,784,154
Fans	55,212	15,444	986,202	1,198,509
Heating and cooking apparatus	182,715	74,302	1,443,578	1,493,747
Insulating wire and cable	575,041	177,536	5,873,334	7,799,532
Interior wiring supplies	282,999	86,822	2,617,167	1,644,985
Arc lamps	1,548	1,250	3,312	1,879
Carbon-filament lamps	16,871	3,980	87,826	119,376
Metal-filament lamps	354,536	104,889	3,111,320	2,920,052
Magnetos, spark plugs, etc.	317,891	140,068	2,982,755	1,269,801
Meters and measuring instruments	254,876	161,462	2,123,176	2,509,383
Motors	1,255,539	525,142	10,154,662	13,997,773
Rheostats and controllers	64,251	77,735	1,225,855	964,363
Switches	425,615	176,154	3,473,439	3,846,199
Telegraph apparatus	24,751	42,769	506,185	928,942
Telephones	282,488	163,397	2,877,427	4,235,552
Transformers	785,300	464,281	3,765,486	7,444,257
All others	3,516,873	1,737,479	24,853,509	25,106,503
Total	$9,988,215	$4,970,332	$78,318,655	$86,143,034

shows that the past month exceeded September totals in only eight items, including interior wiring supplies, arc lamps, carbon lamps, metal-filament lamps, magnetos and spark plugs, rheostats and controllers, switches and accessories, and transformers. As in the previous month, transformers made the best gain, one of approximately 35 per cent. Insulated wire and cable, with a total of $177,536, showed the largest drop, being 30 per cent behind September.

In only two items did the month surpass October, 1920. They are telegraph apparatus and rheostats and controllers. All other items showed a decrease. Motor exports have fallen off most, being valued at only $525,142, as against $1,255,539 in October, 1920.

Figures in the accompanying table have been received from the Bureau of Foreign and Domestic Commerce, Washington, D. C.

Pole Producers Awaiting Freight Reduction

ANY drop that may come in pole prices before the end of the coming season in the woods, according to a large producer, is entirely contingent upon the movement of freight rates. The present stock of poles was brought out of the woods when labor costs were at their peak, and it will be well into spring before a new supply cut under better labor conditions will be available. What lower freight rates in the meantime would mean to buyers can be seen by comparing delivered prices in various cities of the East. A 40-ft., 8-in. Western red-cedar pole is delivered f.o.b. New York for $19.50, in Buffalo for $18.50, in Pittsburgh for $18.10 and in Toledo for $17.55. When the freight rates from the mill to two points as close together as New York and Toledo show a differential of $1.60, it is not difficult to see what a reduction of from 20 to 25 per cent would mean in the cost delivered of several carloads of poles. Prices are now about 200 per cent in advance of the 1915 prices, 90 per cent of

the increase, the producers claim, being accounted for by freight rates and the other 10 per cent by higher labor costs and overhead. At the present time there has been some reduction in rates in the territory west of the Mississippi River, and producers are looking forward to similar action in the Eastern classification territory.

In spite of the fact that some potential buyers are holding off on account of the possibility of lower prices, October is reported to have been one of the best months for pole producers in the last year. There has been some new construction work in the East with quite a bit of maintenance and replacement activity in the South and Middle West. Supply is the best for some time, being sufficient to fill almost any demand. One large producer reports over 2,000,000 poles in stock in various yards throughout the country. There is no difficulty in obtaining cars for shipment, one producer even having gone so far as to permit his privately owned cars to be put on sidings.

Freight and Interest Cut Will React on Electrical Industry

TWO important steps toward readjustment of business conditions have just been taken in the reduction of the Federal Reserve rediscount rate to 4½ or 5½ per cent, depending on the locality, and the cut of 10 per cent in freight rates on agricultural products. In the opinion of several large electrical manufacturers and jobbers interviewed by a representative of the ELECTRICAL WORLD, these reductions should react favorably for them within the near future.

At the present time the farmers in many parts of the country have been unwilling to liquidate their loans with the cash they have received for their season's crops, but the reduction of interest rates will induce them to do so in order to take advantage of the lower rate on new loans. This action will free considerably more money, and the opportunity will then be ripe to push the sale of farm light and power plants, 32-volt accessories, farm-line equipment, appliances, etc. Moreover, a general liquidation will result from this, extending back through the dealer to the jobber and to the manufacturer. Not much of this has been observed as yet on account of the comparatively short time the new rate has been in effect.

Lower freight rates on agricultural products, coming now at the season when crops are moving well, are hoped to have the same effect—that of freeing more money in the farm district, with the same happy consequences.

Christmas-Tree Lighting-Set Business Expected to Be Good

ADVICES received from both manufacturing and distributing sources in the past week indicate that for the next two months business in miniature lamps, including Christmas-tree lighting sets, is expected to be good. It is true that a good many jobbers and some dealers had a carryover from last year, but this was not unwieldy, and in addition a new type of outfit has been put on the market and there have been good orders for this as it has proved popular with the public.

In the East jobbers already have or have on order from one-half to two-thirds of the stocks they put in last year, but as there was very little carryover these orders may be regarded as cautious feelers. As yet dealers in that section are not expressing any active demand, but things are expected to open up more fully about the first of December as retailers seem reluctant at present to order from jobbers unless they are being prodded by the public. Three leading jobbers in New York expect to dispose of from 750 to 1,000 sets each this year. These figures are from 25 to 30 per cent below last year and are conservative estimates of business which is almost sure. The eight-light set, which is proving a popular type, is listed at $4.75 with 40 per cent off in lots of one to twenty-five and 45 per cent off in lots of twenty-five to fifty.

In New England small-lot buying is under way from jobbers. So far, the report continues, there is little tendency to stock up, but orders very probably will expand as the holidays draw nearer. The same eight-light set is selling at $3 net in Boston, there being included attachments for adding lamps without wiring back to the base plug or receptacle.

In the Middle West both jobbers and dealers seem to be moving cautiously, with neither carrying very heavy stocks. Jobbers estimate that this year's business will be within 15 or 20 per cent of last year's, or even closer. The carryover from last year was not excessively heavy, and as a result manufacturers expect to do a good business there.

Pacific Coast reports are optimistic, inasmuch as dealers there have ordered their full quota for the season in spite of the fact that the carryover from last year was fairly heavy. Here again the popularity of the eight-light set overshadowed the question of the carryover. Jobbers there are expecting delivery of their orders within the next couple of weeks.

The market on other miniature lamps is picking up also. The booking of a leading manufacturer has increased 40 per cent in the last three months on automobile lamps and other miniatures. Whether this is due to more confidence on the part of jobbers and dealers or to an actual increase in use it is difficult to say. This same manufacturer reports the possibility of a shortage of Christmas-tree lighting sets if demand is equal to that of last year, as some makers cut down their production considerably earlier in the fall. Business in flashlight bulbs is picking up also, this being a seasonal phenomenon. Manufacturers state that, strangely enough, the demand curve for miniature lamps is fairly steady all the year round and has been for the last two years, whereas before that there was a heavy demand in October, November and December of each year and a light demand the remainder of the year.

Foreign competition in the miniature lamp business seems to be on a par with last year, about 8,000,000 lamps being imported up to Oct. 1.

Metal Market Situation

THE domestic copper market during the past week has been featured by purchases by the brass makers and the rolling mills, as was the case the week before. Wire makers placed a few orders, but their needs are reported to be well covered. There is a distinct improvement in copper, and not for some time have the producers been more optimistic about the outlook. One most noticeable development has been the disposition on the part of consumers to provide against future requirements, and considerable business has been reported covering deliveries over the first half of next year.

Some of the largest sellers are consistent in their unwillingness to quote beyond January, but it is much rumored that sales have been made extending shipment as far ahead as June. The effect of this buying has been to strengthen the hands of the sellers, and the market has been advancing steadily an eighth of a cent at a time. Spot prices on electrolytic have been fixed at 13¾c. by the refineries.

NEW YORK METAL MARKET PRICES

	Nov. 14, 1921	Nov. 21, 1921
Copper	£ s d	£ s d
London, standard spot	67 0 0	67 0 0
	Cents per Pound	Cents per Pound
Prime Lake	13.25	13.37½—13.50
Electrolytic	13.12½	13.25
Casting	12.37½	12.50—13.62½
Wire base	14.75	14.75—15.00
Lead, Am. S. & R. Co. price	4.70	4.70
Antimony	4.70	4.55
Nickel, ingot	41.00	41.00
Sheet zinc, f. o. b. smelter	9.00	9.00
Zinc, spot	5.20—5.25	5.15
Tin, Straits	28.75	29.75
Aluminum, 98 to 99 per cent	24.50	29.50

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	10.50 —10.67½	10.50—11.00
Brass, heavy	5.00 — 5.25	5.00 — 5.25
Brass, light	4.75 — 5.00	4.75 — 5.00
Lead, heavy	3.75 — 4.12½	3.75 — 4.12½
Zinc, old scrap	2.50 — 2.75	2.50 — 2.75

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

JOBBERS in all sections of the country report a steady movement of supplies, though not much improvement over October is noted by any center but New York. Several large New York jobbers have stated that if the present volume of sales continues the current month will be unusually satisfactory. Much of this business is in wiring supplies. In New England business is running along smoothly and retail trade is improving noticeably owing to better general business conditions there. As a contrast to this, retail sales in Atlanta and the Southeast have slumped, though jobbers are finding satisfactory business.

A few price cuts have come through during the week. Chicago notes a 10 per cent cut on high-tension equipment, New York a 5 per cent lower discount on outlet boxes, and the Pacific Northwest a slight reduction on switch and conduit boxes, knobs, tubes, cleats and pole-line hardware.

Construction seems to be keeping up unusually well for the time of year and wiring materials are going well. In the Pacific Northwest wiring work is so plentiful that there is a shortage of electricians.

NEW YORK

Activity in the electrical trade has held up well this week, and the demand for wiring materials is increasing gradually. Jobbers report that at the present rate of increase November sales will exceed those of October despite the fact that there were three extra holidays in this month. Prices remain virtually the same as last quoted, with the exception of outlet boxes, which have been advanced about 12½ and 14 per cent for galvanized and black boxes respectively. On a few items some price competition has appeared; however, this has been caused by the desire to move large stocks and is by no means general.

Little change has been noted in the demand for heating appliances and household devices. Manufacturers are again warning the trade against last-minute orders for holiday delivery. It is expected that this business will develop rapidly after Dec. 1.

Conduit.—Prices have stiffened slightly this week on the strength of the generally better tone to business and increasing demand. Jobbers' prices this week ranged as follows: For ½-in. black pipe in 2,500-ft. lots, $48.29 to $50.83; ¾-in., $62.06 to $65.32, and 1-in., $88.51 to $93.16 per 1,000 ft. Galvanized pipe in the same sizes was quoted at $53.19 to $55.93, $68.61 to $72.22 and $98.91 to $103.36. Stocks are good in the above sizes.

Rubber-Covered Wire.—Conditions in the wire market remain about as last reported. Demand is moderate and orders are for small quantities. In 5,000-ft. lots No. 14 rubber-covered is quoted at $6.50 to $6.60 per 1,000 ft. It is understood that jobbers with large stocks have shaded these prices slightly on orders for larger quantities.

Flexible Armored Conductor.—The active demand for this material continues, and while jobbers' stocks are low and the available supply from manufacturers is limited, prices remain unchanged. No. 14, two-wire, single-strip, is quoted at $44.50 to $46 per 1,000 ft. in lots of that quantity. Double-strip is quoted at $46.50 to $48 per 1,000 ft.

Loom.—Prices on this material remain about as last quoted, although manufacturers claim that because of the cost of cotton present prices are unprofitable. Both the ⅜-in. and the ¼-in. sizes were quoted at $18 per 1,000 ft. in that quantity.

Lamp Cord.—Demand is only moderate and stocks generally are good. No. 18, cotton, twisted, sells for $12.90 per 1,000 ft. and parallel in the same size sells for $15.60 per 1,000 ft.

Outlet Boxes.—An advance of about 14 per cent on black boxes and 12½ per cent on galvanized boxes became effective the first of this week, when the maximum discount was decreased 5 points. Formerly the maximum discount on black boxes was 65 per cent and on galvanized boxes 60 per cent. This has been reduced to 60 per cent and 55 per cent respectively.

Schedule Material.—Like other items of wiring supplies, this material is moving satisfactorily. Jobbers' stocks are good. In standard package lots key sockets were quoted at $18.15 per 100 and full sockets at $33 per 100.

CHICAGO

Although the electrical business has been steady in nearly all lines, the outstanding feature of the week was a 10 per cent reduction on high-tension equipment by a local manufacturer. The steady flow of electrical goods is encouraging to jobbers and dealers, but the majority of them feel that a slow but firm revival of business would be more beneficial to the industry than if a selling boom were started with the possible precipitation of a "second depression." Jobbers and dealers are alert for future business, and they are also in the field for new supplies since their stocks are often on limited bases.

The organization of more than 150 civic and business men for the purpose of supporting the Landis award is continuing to gain strength; and since a majority of business men are backing this movement, some strong action may be expected to develop.

Wire.—Movement on No. 14 rubber-covered wire has been steady during the week, although it still sells for $6.50 to $6.60 per 1,000 ft. in 5,000-ft. lots. Weatherproof has not changed in price or demand and is selling for 16½ cents a pound in 1,000-lb. lots. Bare wire base remains at 16½ cents, and jobbers report some fair sales.

Conduit.—Action on conduit has been on the increase, but ½-in. black pipe still sells for $46.60 to $48.50 per 1,000 ft. in 5,000-ft. lots. Jobbers' stocks are sufficient to meet the present calls, and many are adding to their supplies only when necessary.

Flexible Armored Conductor.—This material has moved steadily during the week, showing that suburban residential building is continuing. The No. 14 two-wire double-strip price ranges between $47 and $50 per 1,000 ft. in 5,000-ft. lots. A number of jobbers have stocks on hand to supply a large amount of trade, but in general the majority of jobbers are working on small stocks.

High-Tension Equipment.—One manufacturer announces a reduction of about 10 per cent on practically all his line of equipment. Sales on heavy busbar supports seem to indicate that central-station companies are giving some thought to future extensions and also to replacement of present inadequate apparatus. Another manufacturer reports a sale of complete high-tension equipment, including the steel structure, for two 6,000-kva. substations for Pennsylvania coal mines. Still another company tells of a large order for indoor substation apparatus for a central station in the Pacific Coast region.

Poles.—Movement on poles has declined slightly from the activity previous to the railroad strike threat. A 30-ft., 7-in. top Western red cedar pole sells at Chicago for $7.50, a slight reduction in price from the previous quotation. Stocks are still large.

Heating Appliances.—This line continues to be the center of interest in the retail trade. Ironers and heating pads are reported as the leaders, while hollow ware, grills and toasters are not far behind. Open-air heaters are selling well with the continuance of cold weather.

Farm-Lighting Plants.—Fair sales on small to medium-size outfits have been reported.

BOSTON

Business ran on an even keel last week, the principal demand being for wiring material. No shortages were reported, and jobbers bought mainly for current needs. Prices underwent minor readjustments in the schedule material line. Building and engineering contracts for the week ended Nov. 15 totaled $2,743,000 for New England. Retail trade is improving, and the latest statement of the Federal Reserve Bank of Boston reports that sales of the eight largest department stores of Boston in October were the greatest for any month this year and 5.8 per cent ahead of October, 1920. Retail trade outside Boston has begun to increase, with favorable comparisons against last year's business. A slight turn for the better is evident in the metal-working factories of New England, and the textile industries continue their excellent volume of output. Prospects of better labor conditions in the shoe industry were features of the week-end news.

Wire.—Widely scattered wiring jobs are causing fair sales, though orders are of moderate size for the most part. Rubber-covered No. 14 sells at $6.25 per 1,000 ft. in 5,000-ft. lots to $6 in 25,000-ft. consignments. Weatherproof wire is showing little activity, the base being 15½ cents. Scarcely any bare wire seems to be moving at present except occasionally for extensions of central-station bulk service supply.

Radiators.—Unseasonably warm weather has retarded sales. Stocks are in good shape for immediate requirements should a cold spell emphasize the value of this equipment. Prices are steady, and considerable competition between makes of different grades is in prospect.

Lamps.—Continued active demand is reported, with current needs being comfortably served. Prices are steady, but revisions in the miniature schedules are expected soon.

Meters.—Trade is more vigorous than for some time. Modifications in wiring requirements due to the new code in connection with carrying conduit to the service box are causing some additional meter sales, it is reported. Interest in combination meter and safety switch installations is more evident. Meter stocks are not being strained by present demand, so far as has been learned.

Loom.—The demand is relatively dull. In 5,000-ft. lots ½-in. loom sells for $16.50 per 1,000 ft. and ¾-in. loom for $19. Stocks are plentiful.

Sockets.—Light sales are reported, with no difficulty in getting orders filled promptly. Prices are steady, case-lot quotations on pulls being 31½ cents net, keys 18 cents, and keyless 16½ cents. Brass manufacturers are a little busier, and a gradual improvement in demand appears to be under way in the switch and socket-making plants.

Appliances.—A lull in this class of trade appears to be on. Slow recovery in the unemployment situation is affecting purchasing power, but in retail circles better business should be experienced in a week or two at the outside. It appears probable that jobbers will be called upon this year to supply current demands well into the Christmas season, owing to the amount of small-order buying which has characterized the fall trade.

ATLANTA

Reports from retailers indicate that somewhat of a slump in the amount of business done this week from that of several weeks preceding is in evidence, owing possibly to inclement weather. The electrical jobbing business, however, seems to be holding the pace of prior weeks. No increase has been registered for the past fortnight, orders having settled to a fairly uniform volume. Jobbers report that their orders on manufacturers will be very light from now until the first of January, purchases being made only on the hand-to-mouth basis. Plans for a systematic agricultural marketing program are beginning to crystallize, and in a large number of the small cities throughout the State grain warehouses have been established. If the Farm Bureau's plans materialize, it will provide for a more systematic marketing throughout the State and less fluctuation in business conditions in rural districts. The general improvement in conditions is reflected by statistics which show that sales for August, 1921, in the Sixth Federal Reserve District approximate 180 per cent of those for August, 1917, the third largest percentage of all of the reserve districts.

Outlet Boxes.—In the face of a rather slow movement in this line an advance in price of 5 per cent is announced this week. Stocks are in excellent shape.

Meters.—A slight increase in the volume of sales is to be noted, the 5-amp. and 10-amp., two-wire type constituting approximately 90 per cent of the business. Jobbers' stocks are fair to good in all sizes.

Conduits.—A steady demand is reported in all sizes, with no recent change in price. Stocks are ample.

Portable Lamps.—Local retailers' stocks will be complete within the next ten days. This specialty is already moving quite satisfactorily, and local firms anticipate a volume almost up to that of last year.

Toys.—Jobbers' stocks are in good shape, despite the fact that they have placed few orders on manufacturers owing to heavy carry-overs. Retailers are just beginning to send in orders for their holiday requirements.

Insulators.—Porcelain and glass telephone insulators rated for 2,300 volts fail to keep pace with pole-line material, the demand not being quite up to expectations. Stocks are good, with no recent price change.

Lamps.—As was to be expected, this line is moving excellently, particularly in the 60-watt and 75-watt tungsten and 75, 100 and 150-watt type C. The series street lamps are very slow. Stocks are in good shape.

Porcelain.—The movement in this line is confined to "Nail-it" knobs, cleats and 3-in. tubes, none of which, however, is selling as well as has been the case for the past two weeks. Jobbers' stocks are good to heavy.

Oil Switches.—Industrial activity has created a fairly good demand for the 550-volt and 2,300-volt oil switches of the automatic type. In the more popular sizes stocks are in good condition, while factory shipments are prompt on the larger sizes.

High-Tension Arresters.—In voltages up to 38,000 there is a fair demand. Manufacturers are making very prompt and satisfactory shipments. No recent changes in price are to be noted.

ST. LOUIS

Jobbers generally report improved business. Appliance sales have naturally been a feature owing to holiday-goods buying, but improvement was also noted in wiring supplies, both industrial and residential. The volume of appliance orders being placed by the dealers is keeping jobbers' stocks at a low point, there being an actual shortage of some items. Jobbers are buying cautiously, however, as good factory deliveries can be had. The demand so far has been almost entirely for heating appliances. One jobber is of the opinion that the holiday trade this year will be as good as it has ever been in the past.

A strong effort is being made by all those interested to get building costs on such a basis as will stimulate construction work. Assurances have been given by prospective builders that they will start construction by April 1, 1922, on work totaling $14,200,000, if labor will accept a 20 per cent reduction in wages and if material prices are cut about 12 per cent. Of the amount pledged, arrangements have been made to finance all but about $2,000,000. A leading banking house has offered to reduce the regular commission for making loans from 3 to 2½ per cent. If some agreement between all those interested is reached, the entire electrical industry here will be materially benefited.

Wire.—Some improvement was noted in the movement of the larger sizes of rubber-covered last week, resulting from the improving condition of the industrials. Stocks of the larger sizes are somewhat heavy, but No. 14 rubber-covered supplies are short. The latter wire is selling from $6.40 to $6.50 per 1,000 ft. in 10,000-ft. lots. The base on bare and weatherproof remains around 16 cents per pound.

Knobs and Tubes.—Stocks are low, and one jobber's stock is completely exhausted. The demand has been increasing because of better residential work and because contractors and dealers are carrying heavier stocks. "Nail-it" knobs are priced at $17.50 per 1,000, 2½-in. tubes at $5.25 per 1,000, and 3-in. tubes at $5.75 per 1,000, all prices being for barrel lots.

Switches.—Reasonably good business is reported, with a tendency to increase because of continued residential work. Stocks are in good condition. The 5-amp. single-throw non-indicating snap switch sells for $20.20 per 100, and the same switch of the indicating type sells for $23.20 per 100. The single-throw push-button switch is priced at $21 per 100; the three-way push-button switch at $30 per 100, and the single-gang plate at $8.40 per 100.

Conduit.—Short stocks of ½-in. black conduit continue, and stocks of ½-in. galvanized have been somewhat reduced. However, stocks of the larger sizes remain heavy. The call for residential work continues good. Half-inch black is priced at $47.25 and ½-in. galvanized at $53.15, both per 1,000 ft. and in bundle lots.

Tape.—The following prices have been established by a leading jobber on friction tape: Less than 5 lb., 45 cents per pound; 5 lb. to 50 lb., 37 cents per pound; 50 lb. and more, 34 cents per pound. Prices on rubber tape are about the same. Stocks here are somewhat low, and movement the past few weeks has been on an attractive scale.

Waffle Irons.—An unexpected development of the holiday purchasing is the strong demand for this item, and the stocks of a number of jobbers are entirely gone, though early replacement from the factory will be made. The substantial reduction in prices made since last year is the principal contributing factor.

SAN FRANCISCO

No great amount of new large construction is reported, most of the permits being for flats, bungalows and smaller apartments. However, many of the larger office buildings have reached a stage where they are ready for their electrical equipment, so that a steady call for roughing-in material and wiring devices is reported. On the other hand, there is a decided drop in the sale of appliances, especially of the larger kind. The rules of the industrial show covering California-made products, which opened in San Francisco on Nov. 19, have been amended to permit some local dealers to display electrical devices largely sold, although not manufactured locally. It was felt that this business required some stimulation which the fair could give.

Farm Lighting Plants.—The current year has not been an altogether disappointing one, despite lower sales than those of last year, because the same condition is true of many other lines that are far better known and advertised. In fact, the sales even as they are guarantee that farm plants are now definitely established as indispensable farm adjuncts and assure a good season for 1922. The average outfit sells locally for about $500.

Lamps.—The lamp season is approaching its peak with no sign of any shortage or delayed orders. A slightly increased call for white tungstens is reported. The Oakland lamp works are being enlarged so that not only Edison and National lamps but also Westinghouse lamps will be assembled and stored.

Christmas-Tree Outfits.—Almost every dealer has ordered his quota for this season, the orders being surprisingly large in view of the fact that a considerable number of outfits were carried over from last season. This greater demand is probably caused by the new type of outfit sold in multiples of eight. Jobbers' stocks are still enroute from factory.

Washing Machines.—The demand is now lower than it has been all year. This sudden slump is surprising, for general conditions are no worse than they have been and the financial wounds of the builders' strike are almost healed. Tumbling prices and the expectation of future decreases have probably produced this condition.

PORTLAND—SEATTLE

General business seems to have slackened a little compared with preceding weeks. The outstanding feature of the return to normal is the unusually heavy shipments from the ports of Portland and Seattle. These consist principally of lumber, apples and grain. Electrical jobbers report satisfactory conditions, but business is not characterized by any sensationally large contracts as in boom times. A steady, healthy demand exists, however, and the coming holiday trade is expected to stimulate things for the next month. Jobbers of Portland report activity in appliances, line material and in wire of the smaller sizes, indicating a continuous activity in residence building. Slight price reductions in switch boxes, conduit boxes, knobs, tubes, cleats and pole-line hardware were announced last week. Contractor-dealers report unusually good business, particularly in the contracting line. There are in fact so many wiring jobs on hand that there is a scarcity of journeymen electricians.

Rubber-Covered Wire.—The market has been strengthening steadily during recent weeks, and quotations are somewhat higher. No. 12 sells at $9.20 per 1,000 ft. in 5,000-ft. lots, while No. 14 is quoted at $7. The demand for moderate-sized lots is very good. Local stocks are good.

Pole-Line Hardware.—A normal demand to take care of replacements and minor extensions is noted in this material. Some large orders for New York are in prospect. Following a weak market, price reductions averaging from 15 to 20 per cent in the various items have been made.

Household Appliances.—Among the larger items of household appliances, ranges and washers continue as the best sellers. These are rapidly becoming recognized as economical and convenient, if not actual necessities. Of electric ranges this is increasingly true, since increases in gas rates, coupled with a reduction in heating value, have made the use of gas in this section expensive and relatively undesirable. These facts, together with considerable price reductions from the peak values, have resulted in a very satisfactory movement in this line.

SALT LAKE CITY—DENVER

A general strike in the coal-mining regions of Colorado has been called and is already seriously affecting production. The military force has been called out by the Governor to preserve order in one of the chief mining counties, with prospects of the emergency measure extending to other affected areas. Conflicting reports as to the seriousness of the strike are rife, but it seems fairly certain at this writing that the unions have already accomplished a 50 per cent reduction in the state's coal output. No prospect for immediate settlement is yet in sight. The unions are protesting against a proposed 30 per cent reduction in the wage scale.

A noticeable increase in the number of unemployed in the Intermountain territory is reported by official statisticians. The reason for this condition is the falling off in demand for farm labor at the end of the harvesting season. It is expected, however, that thousands of jobless men will find work on projected highway construction that will soon be under way as a result of the federal aid law. Several million dollars is now available for road building, and the Intermountain States are hastening the launching of extensive construction.

The copper metal market has improved substantially during the past three months. Against a monthly output of 40,000,000 lb. the deliveries by the refineries in August were 104,000,000 lb. and in September 109,000,000 lb., while October is believed to have been fully up to the previous month. At this rate of consumption it is fair to forecast augmented production before many months have passed. The merging of several big steel, coal and iron corporations for the purpose of the development of the steel resources of Utah promises a significant expansion of business and industry which will largely affect the Intermountain country.

A big building boom is said to be waiting on a reduction in the cost of materials, especially cement, a reduction in freight rates and an adjustment of interest rates.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Sales of Farm-Lighting Sets Improving

Sales of farm-lighting sets the country over show a real improvement over last year, declared E. B. Dunigan, New England manager of the Delco Light Company, to a representative of the ELECTRICAL WORLD a few days ago. Out of twenty-eight sales districts all but four show an increase in business, including pumping equipment, and the whole country from Jan. 1 to Oct. 31 showed a gain of about $25,000 compared with the same period of 1920. While this gain is not a striking one, it indicates a thoroughly satisfying change in the trend of business and taken in connection with recent price changes presages well for the future demand for this class of equipment. Purchases of lighting sets by farmers of moderate means and by summer cottagers have been active this year.

New Cable & Cord Company

The McConnell Cable & Specialties Company, 426 South Clinton Street, Chicago, has been organized by P. G. McConnell, formerly a department manager of the Belden Manufacturing Company, Chicago. Mr. McConnell resigned Oct. 31 in order to enter the electrical cable field for himself and will specialize in special cords and connectors and automobile electrical accessories.

Westinghouse Service Department Changes

The Salt Lake City service department of the Westinghouse Electric & Manufacturing Company has been made a branch of the Denver office under the direction of A. F. Maccallum, district service manager, Denver. M. R. Davis, formerly district service manager at Salt Lake City, will remain there and devote his time to sales service work and to securing repair business for both shops. There have been changes also in the Seattle office, according to the announcement of the company, B. B. Burkett having been appointed district service manager to succeed N. P. Wilson. Mr. Wilson has been transferred to sales service activities on switchboards and similar apparatus in the Seattle territory.

Milwaukee Company to Make Electric Alarm Posts

The Fire & Police Alarm Post Company, Milwaukee, recently incorporated with a capital stock of $25,000, will develop the manufacture of patented cast-iron and steel posts for fire and police alarm telegraph systems, automatic traffic-handling devices and similar equipment designed by Hugo A. Kleinsteuber, assistant superintendent of the Milwaukee fire and police telegraph alarm division. The general office of the company is at 120 Miller Building, while the factory, newly acquired, is at Thirty-ninth Avenue and Mitchell Street. The officers of the company are: President, P. J. Hayes; vice-president, Leopold Wieland; secretary, C. L. Harder; treasurer, G. F. Carroll. The posts will be marketed through agents in various cities. The Milwaukee municipal government already has purchased 250 of the posts.

Electro Refractories Corporation to Rebuild

The Electro Refractories Corporation, Ellicott Square, Buffalo, contemplates rebuilding its factory, which was recently destroyed by fire, causing a loss estimated at $200,000. The contract for the new plant, which is to cost approximately $100,000, has been let to Harding & Crea, Buffalo, and includes a factory, 50 ft x 300 ft., and a machine shop, 30 ft. x 75 ft., on Town Line Road, between Buffalo and Lackawanna. Construction will be started at once, according to L. U. Milward, manager of sales, and the company expects to be back in production by Dec. 15.

Tindall & White Acquire Perfection Company

Tindall & White, Inc., 329 East Twenty-second Street, New York City, have taken over all the rights and interests of the Perfection Sales Company, formerly at the same address. The company will continue the manufacture of the Perfection shade, and all-metal lighting bowl. The personnel of the old company will remain under Tindall & White. The officers of the company are: President and general manager, W. L. Tindall; treasurer, R. W. Tindall, and secretary, C. A. White.

Electric Vehicle Men Hold First of Monthly Luncheons

The first of a series of luncheons to be given by and for men interested in the electric vehicle business of New York was given on Nov. 17. According to the announcement sent out by Charles R. Skinner, Jr., of the New York Edison Company, the luncheon was entirely for the purpose of getting the New York electric vehicle men together and promoting the feeling of good-fellowship and co-operation which already exists. This first luncheon was very well attended, there being over sixty-five men present, representative of the electric vehicle, the storage battery and the accessory industries. Those in charge of the luncheon felt that this was a very good attendance for the first meeting, and plans were at once made to hold the second luncheon on Dec. 15. A feature of the first meeting was the absence of any set speeches. An announcement was made, however, of an electric vehicle meeting to be held on Dec. 2. Further details may be found on page 1088 of this issue.

Apex Company Aids Dealers in Financing Sales

It is the belief of the Apex Electrical Distributing Company, Cleveland, Ohio, that dealers in its appliances find it impracticable to finance all their time sales, and as experience shows that selling on the installment plan triples and even quadruples the electrical appliance business, the company has put into effect a plan whereby all their dealers may finance their time sales through a central financing company. A detailed explanation of the financing plan has been issued by the company in booklet form and a second booklet tells the dealer how to go about collecting his accounts and keeping a record of them.

The collection system, according to R. J. Strittmatter, sales manager, is considered one of the most important parts of the plan. It is readily apparent, he states, that to the smaller dealers the mere offering of a financing plan is not sufficient, because the small dealer usually does not have a good bookkeeping system and is very apt to fail to collect his accounts properly. For this reason the Apex company supplies all the necessary forms such as ledger sheets, follow-up system, collection pads, complete series of collection system and everything else that goes with the following up of a sale of this kind.

Robbins & Myers Add to Philadelphia Space

The Robbins & Myers Company, whose headquarters are at Springfield, Ohio, has leased a one-story building at 229-231 North Twenty-third Street, Philadelphia, for use as a new warehouse and distribution point. The building has a floor space of 6,000 sq.ft. The Philadelphia offices of the company are at 1418 Walnut Street.

American Firm Grants British Sales Rights

The Metropolitan Vickers Electrical Company, Ltd., with principal offices in Manchester, England, has just completed arrangements with the Railway and Industrial Engineering Company of Greensburg, Pa., whereby the latter company grants to the Metropolitan Vickers Electrical Company, Ltd., the exclusive rights to manufacture and sell apparatus of the R. & I. E. design in the entire British Empire, with the exception of the British North and South American possessions.

G. E. Increases Small Motor Production at Fort Wayne

As a result of increased orders the small-motor department of the General Electric Company at Fort Wayne, Ind., has been placed back on full time, with a complete force of men working. A few men are being called back from furlough, and all are working five days and a half a week in place of the four days that they had been working formerly. The increase in hours and force will last at least for six weeks, as orders will guarantee operation for that length of time, it is understood. Whether similar increases will be made on other departments in the next few days was not predicted by officials. It is possible, however, that these will be made in the near future. The meter department

is also back on full time, and it is also stated that the Decatur works are back on a normal basis of operation. Fractional-horsepower motors are also made at Decatur.

Milwaukee Company Again Makes Storage Batteries

The Globe Electric Company, Milwaukee, has re-entered the automobile storage-battery field after having discontinued this line for some years. In the interim the company manufactured belted and direct-connected farm light and power plants and also Faure storage batteries for this class of equipment. A large one-story factory has recently been erected by the company. The officers are: President, John I. Beggs; vice-president, J. H. Gugler; secretary and general manager, J. D. Wanvig, Jr.; treasurer, C. O. Wanvig.

Laundryette October Sales Best in Last Year

October sales of the Laundryette Manufacturing Company, Cleveland, washing-machine manufacturers, came within a few per cent of those for October, 1920, the best month the company has ever had, according to the Nov. 3 issue of the company's house organ. The one thing that prevented the overtopping of the highest previous month, it was declared, was the fact that production at the factory, though increased 30 per cent, was unable to cope with the demand. Orders placed since Sept. 15 have been delayed on account of this. This encouraging pick-up in sales, the company states, is due in large part to the great increase in public demonstrations and also to a vigorous advertising campaign, carried on in publications and directly by mail.

West Virginia Armature Company Acquires American Armature

The West Virginia Armature Company, Bluefield, W. Va., has taken over the property of the American Armature & Engineering Company at Mullens, W. Va. The business will be operated more or less as a branch of the West Virginia company and is particularly well equipped for general-repair and power-house work. The principal business of the main plant at Bluefield will continue to be armature winding. Armature coils and brass bearings are manufactured there, and a fair stock, according to the announcement of the company, will be maintained at Mullens. W. A. Bishop is president of the company, James W. Bailey secretary-treasurer, and A. L. Smith vice-president.

Rush Job on New Hell Gate Station by Chatham

An example of how quickly an electric wiring job can be done when it becomes necessary is being given by the Chatham Electrical Engineering Company, Inc., of New York, at the new Hell Gate power house of the United Electric Light & Power Company in the same city. This plant when completed will be one of the largest steam-driven generating plants in the world, having an initial capacity of 140,000 kw. and an ultimate rating of approximately 280,000 kw. Thomas E. Murray, Inc., New York, are designing and constructing engineers for the entire plant.

Actual work on the purely electrical construction, pulling of cables and wiring, erecting of switchboards and the installation of the necessary electrical equipment was started on Sept. 1, and this part of the work was expected to require about a year for completion. However, demands for additional power were so pressing that it became a necessity to complete the electrical installation in the shortest period of time possible, thereby accomplishing in approximately four months what was considered a year's work. Already one of the units is in service. The existing unusual business conditions made possible the selection of carefully picked technical men for every branch of the staff and personnel, and the actual results being obtained demonstrate what can be done to meet emergency conditions. The first high-tension test, made on Wednesday, Nov. 3, proved that neither the factor of safety nor the quality of the work had been lowered by the enforced speeding up of the work.

Approximately 52 per cent of the work was completed on Nov. 1, and the contract is expected to be finished by Dec. 31, making a record for an installation of this size.

A GATHERING OF CHATHAM COMPANY EMPLOYEES WHO SPEEDED ELECTRICAL JOB ON HELL GATE STEAM PLANT

Large Japanese Order Placed with Westinghouse

An order for substation material amounting to $76,000 has been placed with the Westinghouse Electric & Manufacturing Company by Japanese railway interests, indicating better business conditions in that country. This order covers the complete equipment for two substations and includes eight rotary converters, twelve transformers, two complete switchgear equipments and station lighting transformers.

Other large orders for railway material recently have been placed in this country by the Seto Electric Railway Company, the Bisai Electric Railway Company, the Nagasaki Electric Railway Company, the Tokyo municipality and other large Japanese railway operating companies and municipalities.

The Northern Electric Company is now at 224 North Seldon Street, Chicago, having moved from 542 St. Clair Street on Aug. 15. Manufacturing facilities of the company are increased about 300 per cent, and excellent business on heating appliances for the months of September and October is reported.

The Klymax Manufacturing Company, 115 North Desplaines Stret, Chicago, bought out the Home Utilities Company of the same address on Oct. 1. This company is developing and improving the "Klymax" washing machine, which the Home Utilities Company produced.

Payne Dean Limited, 103 Park Avenue, New York City, manufacturer of the Dean control for electrical operation of water, gas and high-pressure steam valves, has established offices in Pittsburgh and Chicago. C. J. Burrage, formerly of the engineering department of the Cutler-Hammer Manufacturing Company, Milwaukee, is in charge of the Pittsburgh office, which is in the Bessemer Building. The Chicago office, which is in the Lumber Exchange Building, 11 South LaSalle Street, is in charge of A. H. Kohlbusch, formerly superintendent of construction for the Public Service Electric Company.

The Union Electric Supply Company, Providence, R. I., has been appointed jobber for the Rhode Island district in the distribution of motors manufactured by the S. A. Woods Machine Company, South Boston, Mass.

J. B. Howard, 398 Newbury Street, Boston, has been appointed representative agent for the Walter Motor Truck Company, New York City, manufacturer of electric road trucks.

The Sunny Line Appliances, Inc., Detroit, has appointed the Sausaman-Bradley Company, 441 Monadnock Block, Chicago, as distributer for the "Sunnysuds" electric washing machine in the state of Illinois and in northern Indiana.

The Tiffany Electric Company, Inc., 165 Broadway, New York City, manufacturer of electrical machinery and parts, has under construction a two-story machine shop, 40 ft. x 150 ft., on Howell Street, Jersey City, N. J. It is expected to have the building ready for occupancy by Dec. 15.

The Trico Fuse Manufacturing Company, Milwaukee, announces that it has established a new branch office at 15 William Street, New York City.

Foreign Trade Notes

ELECTRIFICATION OF STATE RAILWAYS IN ITALY.—Reports forwarded by Assistant Commercial Attaché Osborne of Rome indicate that the Director-General of the State Railways is suggesting that the government have the reparations account settled in part by requiring the Germans to hand over the material which could be used in electrifying the government railways. The office of the Auditor-General is said to oppose this means of settlement and to consider it preferable to have the adjustment of reparations made on a strictly money basis. Plans, according to the report, have been completed for the electrification of the Bologna-Verona-Brenner, the Pisa-Leghorn and the Venezia-Giulia lines, as well as for a shortened route between Rome and Naples. Studies are being made for the possible electrification of the Naples-Reggio, Calabria and Paola-Cosenza lines. The Director of Railways is negotiating with the Ministry of the Treasury to obtain necessary funds to carry out this extensive program. According to a report received from Commercial Attaché H. C. MacLean of Rome, the *Official Gazette* of Oct. 1 published law decree No. 1,298, whereby the State Railway Administration is authorized to expend the sum of 160,000,000 lire (about $6,400,000 at present exchange) for the purchase of 120 electric locomotives.

STORAGE BATTERIES MANUFACTURED IN ARGENTINA.—Trade Commissioner George S. Brady, Buenos Aires, reports that there is a factory in Argentina (claiming to be the only one of its kind in South America) that manufactures storage batteries for automobiles and for lighting and for wireless sets. The plant employs from thirty-five to sixty hands and is producing at present 40,000 lead-battery plates monthly, of which 25,000 are for automobiles. The maximum capacity of the plant is 100,000 plates per month, besides which it makes lighting and switchboard installations. The lead used in making the plates and all of the lead oxide used come from the United States. Glass jars and hard-rubber containers are manufactured locally. Prices are considerably below those of the imported American article, and the management states that it is prepared to make further reductions to meet foreign competition. The company advertises that it installs complete farm lighting and power sets and has a force of electricians for this purpose. The factory has been in existence for nearly four years, but has only recently begun to push its products actively.

PROPOSED HYDRO-ELECTRIC DEVELOPMENT IN THE HIGHLANDS OF SCOTLAND.—The development of hydro-electric power in the Highlands, according to the *Electrician*, is under consideration in Scotland. Some of the schemes are municipal projects and others are being promoted by private companies. The Moray County Council has been invited by the Banff County Council to co-operate in a joint scheme for providing electricity from the Spey River and its tributaries. A communication has also been submitted by the Town Council of Inverness, which is promoting a hydro-electric project for the northern area. A committee has been appointed to report on both schemes.

PROPOSED HYDRO-ELECTRIC DEVELOPMENT IN SICILY.—According to *Electrical Industries* the Technical Commission for Unemployment has approved the urgent execution of works in connection with the utilization of the river Simeto in Sicily for the production of electric power. The Consiglio Superiore delle Acque has authorized a concession for this purpose and has approved the scheme submitted by Signor Omodeo, engineer. It has also authorized a provisional commencement of the works as soon as the agreement is signed without waiting for the settlement of details. The project provides for the formation of an artificial lake at Vale di Aderno, capable of storing 100,000,000 cu.m. of water. The total cost, exclusive of work in connection with bringing land into cultivation, is estimated at 60,000,000 lire. It is estimated that 14,000 hp. can be developed, while 35,000 hectares of land will be irrigated and cultivated.

NEW ELECTRIC PLANT IN COAL DISTRICT OF CZECHOSLOVAKIA.—The Ministry of Public Works, states *Electrical Industries*, is planning to establish at the Hedwig pits in the coal district of Most (Bruew) a large electric generating station, which will furnish electricity to Prague and central Bohemia. The cost of the proposed plant is estimated at 150,000,000 kronen.

PROPOSED ELECTRIC RAILWAY IN SPAIN.—Preliminary plans for the construction of an electric railway between Corunna and Santiago and Caraballo, Spain, according to Consul Busser at Corunna, are now in the hands of the engineers for submission to local capitalists. A company with sufficient capital has been organized to finance the actual construction work as soon as the electric railway between Corunna and Sada, already laid to Pasaje, is completed. The banking house of Sobrinos de Jose Pastor, Corunna, is interested in the project. The distance from Corunna is about 40 English miles. Five tunnels will have to be built for the line.

HYDRO-ELECTRIC POWER IN CONNECTION WITH ZINC INDUSTRY IN FRANCE.—As a means of stimulating production considerable attention is being given in France to the availability of water power. An illustration of what might be accomplished by a larger use of this power is furnished by the status of the zinc industry, in which production has decreased over 80 per cent since 1913. This is largely due to the fact that practically all French zinc factories, most of which are situated in the Pas de Calais, use coal as a means of production, and at present the high cost of coal is a discouraging factor. In connection with the larger use of water power, an estimate received by the Bankers' Trust Company from its French information service indicates that if the electrolytic process were used the production of zinc could be increased to 120,000 tons of metal yearly, necessitating 300,000 tons of ore, half of which would be imported from French colonies and the other half extracted from the native mines.

PROPOSED ELECTRICALLY OPERATED FERRY AT HOBART.—The parliamentary public works committee, according to *Electrical Industries*, has recommended the government to build an electrically operated ferry between Hobart and Bellerive. The cost is estimated at about £33,000.

ELECTRICAL DEVELOPMENT IN WESTERN SLOVAKIA.—With the financial co-operation of the Czechoslovak government the Western Slovak Electrification Company, according to *Electrical Industries*, has been organized with a capital stock of 8,000,000 kronen, which is to be increased to 16,000,000 kronen in the course of the next three years. The first undertaking of the new company is the electrification of the Bratislava (Pressburg) district.

PRECEDENT SET IN ANTI-DUMPING LAW.—The first specific ruling that a commodity was being dumped in the United States in contravention of the anti-dumping statute has been made by the Secretary of the Treasury at Washington, the material involved being goatskin parchment, according to the American Pulp and Paper Association. The memorandum says in part: "After due investigation I find that the paper-making industry in the United States is being or is likely to be injured by reason of the importation into the United States of goatskin parchment paper, first and second quality, and that such merchandise was sold and is likely to be sold in the United States at less than its fair value." The decision is not only the first relative to paper importations, but is said to be the first of its kind under the anti-dumping act of 1921 relative to any importations. It is expected that electrical apparatus and equipment will be treated in the same manner.

GERMAN ELECTRICAL GOODS IN SPAIN.—During the first seven months of the present year, according to *Electrical Industries*, the Germans sent to Spain among other goods over 2,000 tons of electrical installation material out of a total importation of 4,900 tons and over half the telegraph and telephone equipment imported.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

The representative of a mercantile firm in Australia (No. 306) is in the United States and desires to be placed in touch with manufacturers and exporters for the sale of electrical goods, etc.

A merchant in Norway (No. 324) desires to secure the representation of firms for the sale of electrically driven portable tools, engine-room fittings and mountings, etc.

New Apparatus and Publications

ELECTRIC WASHER AND WRINGER.—The Hendrickson Machine Company, 1310 East Fourteenth Street, Cleveland, has brought out an electric washing machine and wringer, equipped with an electric lamp to permit its use in dark laundries.

HEATING AND VENTILATING UNIT.—The Bayley Manufacturing Company, Milwaukee, has placed on the market a complete, self-contained heating and ventilating plant, which is known as the "Bayley Thermo Unit."

FAUCET WATER HEATER. — The Aetna Electric Appliance Company, Boston, Mass., has placed on the market a "Hotvent" automatic type faucet heater, which may be connected with the ordinary household outlet.

ELECTRIC STOVE. — A light-weight "Duplex" kitchenette electric stove has been brought out by the Redtop Electric Company, Inc., 8 West Nineteenth Street, New York City.

LOADING RHEOSTATS. — The Ward Leonard Electric Company, Mount Vernon, N. Y., is distributing a small booklet describing its loading rheostats.

OHMMETER.—Charles Cory & Son, Inc., 183-7 Varick Street, New York City, have issued a catalog bulletin No. 101-29-A, covering the "Cory-Record" ohmmeter.

POWER EQUIPMENT.—"Allis-Chalmers Power Equipment for Textile Mills" is the title of bulletin No. 139, issued by the Allis-Chalmers Company, Milwaukee, in which it describes and illustrates its line of power machinery and also a complete line of electrical apparatus.

LAMP STANDARD.—The Denver Electrical Laboratories, West Thirty-second Avenue and Shoshone Street, Denver, Col., has placed on the market two new models of its lamp-selling standard, "Cel-A-Lite," models B and C, for counter display.

PORTABLE LAMPS.—The Faries Manufacturing Company, Decatur, Ill., has recently placed on the market a new line of portable electric lamps and adjustable floor portable lamps.

SOCKET PLUG.—The Ajax Electric Specialty Company, 1011 Market Street, St. Louis, has recently placed on the market an improved type of plural socket plug, known as "Ajax" No. 33.

VACUUM BRUSH. — A vacuum brush (motor-driven) for cleaning upholstered furniture has been developed by the O. K. Machine Company, 2131 Fairfield Avenue, Fort Wayne, Ind.

MOTOR STARTING SWITCH.—A motor starting switch ("Mason"), equipped with under-voltage release, has been developed by the Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn.

SAFETY SWITCH.—S. Schmukler & Son, Second and Bainbridge Streets, Philadelphia, have recently placed on the market an externally operated switch.

AUTOMATIC PROJECTOR LAMP.—The Sun-Light Arc Corporation, 1600 Broadway, New York City, has recently placed on the market an automatic projector lamp, "Sperry-Sunlight," of special flaming-arc type. The lamp is manufactured by the Sperry Gyroscope Company, Manhattan Bridge Plaza, Brooklyn, N. Y.

VIOLET RAY MACHINE.—A violet-ray machine ("type J"), with sparkless cords and non-turning electrodes, has recently been placed on the market by the Rogers Electric Laboratories Company, 2015 East Sixty-fifth Street, Cleveland.

TRADE DISCOUNT SHEET.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, is distributing trade discount sheet 1-A, effective Nov. 10, superseding former trade discount sheet 1-A.

ARC WELDING LEAD.—A semi-automatic arc-welding lead has been developed by the General Electric Company, Schenectady, N. Y., for use in conjunction with its automatic arc-welding lead.

ILLUMINATION VALUES.—"Illumination Values and Their Measurements" is the title of bulletin E-101, issued by the Westinghouse Lamp Company, 165 Broadday, New York City, which contains table of present standards of desirable illumination for various classes of service, etc., illustrations of illuminating measuring instruments, etc.

SOAP FOR ELECTRIC WASHING MACHINES.—"How to Use 'Oakite' in Your Washing Machine—It Cleans" is the title of a booklet distributed by the Oakley Chemical Company, 22 Thames Street, New York City, covering the use of "Oakite" in electric washing machines.

TRADE DISCOUNT SHEETS. — The Westinghouse Electric & Manufacturing Company, Mansfield Works, Mansfield, Ohio, is distributing new trade discount sheets as follows: Sheets 9-A, 13-A and 9-B, effective Oct. 25; sheet 1-B, parts 1 and 3, effective Oct. 24.

New Companies

THE STANDARD RAILWAY FUSE CORPORATION, New York, N. Y., has been organized by E. D. Purcell, G. E. McClure and P. H. Miller. The company is capitalized at $50,000 and proposes to manufacture electrical equipment. Newmark & Miller, 154 Nassau Street, represent the company.

THE CENTRAL ELECTRIC COMPANY, Huntington, W. Va., has been chartered with a capital stock of $15,000 to manufacture electrical supplies. The incorporators are Thompson B. Pierce and F. L. Hussey, Ashland, Ky., and R. T. Mosby, Christianburg, Va.

THE ELECTRIC UNITS CORPORATION, 816 First National Bank Building, Chicago, Ill., has been incorporated by Samuel Labow, F. J. Maas and Robert H. Stall, to manufacture electrical appliances.

PORTABLE DRILLS.—The Stow Manufacturing Company, Inc., Binghamton, N. Y., has issued a circular covering the "Stow" portable electric drills.

RADIO APPARATUS AND SUPPLIES.—The Navy Department, Washington, D. C., has issued catalog No. 601, describing the radio supplies and apparatus offered for sale by the department.

ELECTRIC OVENS.—The Oven Equipment & Manufacturing Company, New Haven, Conn., is distributing leaflet No. 108, describing its type "T" conveyor bakers' oven, and leaflet No. 109, covering the "Crawford" sectional continuous oven.

SNAP SWITCHES. — Harvey Hubbell, Inc., Bridgeport, Conn., is distributing bulletin No. 17-6, describing its surface-type toggle snap switches.

DIESEL ENGINE. — The Worthington Pump & Machinery Corporation, 115 Broadway, New York City, has issued two four-page leaflets describing the "Worthington" Diesel engine, two-cycle, solid injection.

THE BEIDNER ELECTRICAL SUPPLY COMPANY, New York, N. Y., has been incorporated with a capital stock of $10,000 to manufacture and deal in electrical equipment. The incorporators are R. Cymberg, M. and H. Edelman. The company is represented by Reisfeld & Comberg, 99 Nassau Street.

THE CRESCENT CITY ELECTRIC COMPANY, Evansville, Ind., has been organized by R. P. Oblinger, H. E. Rasmusson, J. D. Meek and C. E. Roberts. The company is capitalized at $150,000 and proposes to manufacture electrical machinery.

THE DEER ISLE LIGHT & POWER COMPANY, Deer Isle, Me., has been organized with a capital stock of $5,000. The company proposes to operate an electric light and power system and also a gas and water system. The directors of the company are F. M. Haskell, president; Harris W. Haskell, treasurer, and Winslow C. Haskell, clerk, all of Deer Isle.

THE WANDERLET ELECTRICAL APPLIANCE CORPORATION, New York, N. Y., has been incorporated with a capital stock of $100,000 to manufacture electrical machinery. Max Hirshfield, 182 Nagel Avenue, New York City, is interested in the company.

THE WINGO (KY.) LIGHT COMPANY has been incorporated with a capital stock of $2,500 by J. H. Robertson, W. F. Wood and J. B. Barker, all of Wingo.

THE LONDON (KY.) ELECTRIC COMPANY has been organized with a capital stock of $40,000 by W. H. Mayfield and C. Mayfield of Ludlow and E. S. Myers of Springfield.

THE BAGDAD (KY.) ELECTRIC COMPANY has been incorporated with a capital stock of $2,500 by R. L. Harmon, A. D. Harrison and M. B. Harrison, all of Bagdad.

THE DISTRIBUTORS ELECTRIC COMPANY, Canisteo, N. Y., has been organized to operate and maintain a high-tension transmission line between Canisteo and Hornell. The company is capitalized at $20,000. Among the incorporators are J. H. Anderson, T. Churchill Cobb, Leverett J. Simpson and I. M. Rosenberg.

THE PHILLIPSTOWN (N. Y.) ELECTRIC CORPORATION has been incorporated by H. C. Derahan, W. M. Benjamin and W. C. Osborn. The company is capitalized at $50,000 and proposes to operate a local electric light and power system. Osborn, Fleming & Whittlesey, 170 Broadway, New York City, represent the company.

THE CHAMPION ELECTRIC MANUFACTURING COMPANY has filed articles of incorporation under the laws of the State of Delaware, with a capital stock of $4,600,000, to manufacture and deal in electrical appliances. The incorporators are M. L. Rogers, L. R. Wilson and M. M. Nichols, all of Wilmington.

THE RADIO SPECIALTY COMPANY, New York, N. Y., has been organized by H. Kantro, H. Gernsback and D. M. Salzman to manufacture wireless instruments, equipment, etc. G. A. Hoffman, 100 Broadway, represents the company.

THE DAVIS-CARLE ELECTRIC COMPANY, INC., Wheeling, W. Va., has been incorporated with a capital stock of $9,000 by Ray L. Davis, J. H. Carle, H. Poffenbarger and E. B. Maurer, all of Wheeling, and J. E. Rehm, Brookside, Ohio.

THE AQUA ELECTRIC HEATER COMPANY OF CANADA, LTD., St. Hyacinthe, Que., has been incorporated by Louis Agustin, Cornelio A. Morin and Wilfred Girouard. The company is capitalized at $500,000 and proposes to manufacture electrical appliances, heaters, machinery, etc.

THE EVANSVILLE (IND.) ELECTRIC SERVICE, INC., has been chartered with a capital stock of $10,000 to manufacture electrical equipment. The incorporators are Charles Legeman, Sr., Clyde E. Zapp and Charles E. Kiefer, Evansville.

Record of Electrical Patents

Notes on United States Patents

(Issued Oct. 18, 1921)

1,393,751. TRAY FOR ELECTRIC HEATING APPLIANCES; Charles H. B. Chapin, Englewood, N. J. App. filed Feb. 4, 1921. For receiving and supplying current to one or more heating appliances.

1,393,794. SWITCH BOX; Carl H. Kuhlman, Toledo, Ohio. App. filed Jan. 29, 1920. Wall type.

(Issued Oct. 25, 1921)

1,394,667. ELECTRIC LAMP AND HEATER; Elbert A. Corbin, Jr., Swarthmore, Pa. App. filed May 25, 1921. Combined electric heater and lamp.

1,394,689. SELF-WINDING CLOCK; Alfred L. Sohm, Chicago, Ill. App. filed March 31, 1919.

1,394,723. TOLL-TELEPHONE SWITCHING APPARATUS; Herbert M. Friendly and Archibald E. Burns, Portland, Ore. App. filed June 7, 1915. For remotely connecting and disconnecting.

1,394,763. PORTABLE DRIVING MECHANISM FOR TALKING MACHINES AND THE LIKE; Walter Scott, Lakewood, Ohio. App. filed Feb. 19, 1921. Detachable motor and switch.

1,394,768. INSTRUMENT FOR USE IN LEARNING TELEGRAPHY; James E. Smith and Clarence W. Burger, Washington, D. C. App. filed May 21, 1920.

1,394,810. ELECTROTHERMAL GARMENT; Joel E. Craddick, Denver, Col. App. filed April 3, 1919. Heated garment.

1,394,815. ELECTROMAGNETIC RECTIFIER AND CURRENT REDRESSER; Richard A. Engler, Dubuque, Iowa. App. filed March 23, 1914. Vibrating rectifier.

1,394,818. RAIL BOND; Harold H. Febrey, Newark, N. J. App. filed May 28, 1918. "Tunnel" type.

1,394,838. REGISTRY SYSTEM AND REGISTER THEREFOR; C. C. Johnson, Mount Vernon, N. Y. App. filed June 12, 1919. Watchmen's registry system.

1,394,840. REGISTRY APPARATUS; Clarence C. Johnson, Metuchen, N. J. App. filed Jan. 23, 1920. Watchmen's registry systems.

1,394,847. ELECTRIC WATER HEATER; Charles Kratt, Nottingham, England. App. filed Jan. 4, 1921. Rapidly delivers small quantities of boiling water.

1,394,856. ELECTRIC TOASTER; Irwin J. Mendels, Chicago, Ill. App. filed Jan. 31, 1920. Means for assembly.

1,394,875. ARC LAMP; Maurice J. Wohl, Brooklyn, N. Y. App. filed Jan. 14, 1918. Mechanism to control several arcs.

1,394,876. ARC LAMP; Maurice J. Wohl and Harry Hertzberg, New York, N. Y. App. filed June 14, 1918. Used in motion-picture photography.

1,394,891. ELECTRIC HEATING APPARATUS; Henry Geisenhoner, Schenectady, N. Y. App. filed June 21, 1920. Rivet heater.

1,394,899. WATER-COOLED ELECTRIC APPARATUS; Allan B. Hendricks, Jr., Pittsfield, Mass. App. filed Feb. 24, 1920. Transformers, etc.

1,394,901. ELECTRICITY TRANSFORMER AND TRANSFORMING AND CONVERTING APPARATUS; Henry M. Hobart, Schenectady, N. Y. App. filed Sept. 4, 1917. Rotary converter.

1,394,910. REACTOR IN TANKS; Friend H. Kierstead, Pittsfield, Mass. App. filed Feb. 3, 1920. Particularly adapted for large-sized units.

1,394,922. MOTOR-CONTROL SYSTEM; Robert H. McLain, Schenectady, N. Y. App. filed May 14, 1921. Motor may be stopped, started and generally controlled.

1,394,937. RESISTANCE UNIT; Ludwig Reichold, Pittsfield, Mass. App. filed March 28, 1919. Resistance conductor inclosed in metallic sheath.

1,394,942. BUSHING FOR OUTLET BOXES; Peter E. C. Sater, Cleveland, Ohio. App. filed Aug. 16, 1920. For ¾-in. pipe in ½-in. or ¾-in. hole.

1,394,949. RESISTANCE MATERIAL; Ralph W. Stearns, Schenectady, N. Y. App. filed Feb. 19, 1920. Plastic resistance material having a so-called negative ampere-volt characteristic.

1,394,954. METAL-MELTING POT; Tycho Van Aller, Schenectady, N. Y. App. filed Dec. 4, 1919. Metal is automatically maintained at a constant temperature.

1,394,965. ELECTRIC MARKING DEVICE; Clifford A. Bourne, Portland, Ore. App. filed Jan. 5, 1921. To mark upon metal tools.

1,394,971. PROTECTIVE DEVICE; Elmer E. F. Creighton and Frederick R. Shavor, Schenectady, N. Y. App. filed Jan. 10, 1918. Lightning arrester.

1,394,972. ELECTRIC REGULATION; John L. Creveling, Auburn, N. Y. App. filed Oct. 24, 1914. To regulate voltage and current.

1,395,002. ELECTRIC HEATING-ELEMENT CONTROLLING DEVICE; Paul M. Mueller, Erie, Pa. App. filed March 24, 1920. To prevent overheating.

1,395,003. ELECTRIC HEATING-ELEMENT CONTROLLING DEVICE; Paul M. Mueller, Erie, Pa. App. filed March 24, 1920. To prevent overheating.

1,395,007. TELEGRAPH SYSTEM; Arthur W. Post, Westbury, N. Y. App. filed March 20, 1920. Signaling between Morse line subscriber and the attendant at relay office.

1,395,046. AUTOMATIC CIRCUIT-CONTROLLING APPARATUS; Laurence M. Klauber, San Diego, Cal. App. filed March 4, 1920. To eliminate dangers in series electric light circuits.

1,395,065. METHOD OF ADMINISTERING THERAPEUTIC LIGHT TREATMENT; Roy X. Tuttle, Battle Creek, Mich. App. filed Feb. 14, 1921. Alternate heating and cooling.

1,395,066. CONTROLLING MECHANISM; Charles R. Underhill, New Haven, Conn. App. filed Jan. 13, 1917. For governing operated devices.

1,395,108. MULTIPLE CONNECTOR; John W. Haywood, New York, N. Y. App. filed Feb. 27, 1919. Portable multiple-receptacle block.

1,395,117. MEDICAL APPARATUS; Bess E. Johnston, Chicago, Ill. App. filed March 22, 1920. Applying heat, light rays and water.

1,395,120. RADIUM HYDRO-EMANOMETER; George Kunkle, Grand Junction, Col. App. filed March 12, 1917. For rendering water radio-active.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

CAMBRIDGE, MASS. — The Cambridge Electric Light Company has plans under way for the construction of a one-story power house, 80 ft. x 180 ft. French & Hubbard, 210 South Street, Boston, are engineers.

SAYLESVILLE, R. I.—The Sayles Finishing Plants, Inc., is considering rebuilding the power house at its textile mills, recently destroyed by fire.

Middle Atlantic States

BINGHAMTON, N. Y.—The Binghamton Light, Heat & Power Company, it is reported, is investigating the possibilities of extending a transmission line to Apalachin, Tioga Center, Smithboro, Barton, Nichols, and Newark Valley. The company has work well under way on the Whitney Point-Marathan line, a distance of 27 miles. S. W. Murray is manager.

CAYUGA, N. Y.—The Empire Gas & Electric Company, Geneva, has been authorized by the Public Service Commission to construct and equip an electric light and power plant in Cayuga.

ALLOWAY, N. J. — Plans are under way for the installation of an electric light and power system in Alloway. A transmission will be erected from Quinton.

EDGEWATER, N. J.—The Daniels Linseed Oil Company, 20 Ninth Avenue, Minneapolis, Minn., is planning the construction of a 1,000-kw. power plant in connection with its new plant at Edgewater, N. J. Contract for the erection of a number of buildings, including main building, 150 ft. x 250 ft., has been awarded to the Tilt-Hargan Company, 90 West Broadway, New York City. Samuel Mairs is secretary.

HEGINS, PA. — The Hegins Light & Power Company, recently organized, is considering the installation of a light and power system in Hegins.

PHILADELPHIA, PA. — Arrangements have been made by the Department of Transit, City Hall, for the installation of a new underground conduit system on Front Street, for the Frankford Elevated railway lines, to cost about $44,900. W. S. Twining is director.

PHILADELPHIA, PA.—Bids, it is understood, are being received by the city for the construction of several substations. For further information address the Electricity Commission.

PITTSBURGH, PA.—The West Penn Power Company has applied to the Public Service Commission for authority to extend its system in Jefferson, Clarion, Venango, Elk and Lawrence Counties, covering townships adjacent to present operations.

SCRANTON, PA.—Plans have been prepared by the board of directors of Maryland College for the construction of a one-story power house, 40 ft. x 104 ft. John J. Hawley, Traders' Bank Building, is architect.

WEST CHESTER, PA.—The property of the Montgomery & Chester Electric Railway Company has been purchased by Thomas E. O'Connell, president of the Phoenixville, Valley Forge & Strafford Electric Railway. Connections will be made between Spring Valley and other points and Valley Forge, via Phoenixville. A new power house will be built at Williams Corner to supply the entire consolidated line.

MILLSBORO, DEL.—Arrangements have been made by the Council for the installation of an electric lighting system in Millsboro.

BALTIMORE, MD.—Plans are being prepared by the fire department for the construction of a building for an electrically operated fire-alarm system at Lexington Street, to cost about $75,000. Bids, it is understood, will be asked soon.

ELKINS, W. VA.—The Elkins Power Company is planning the installation of additional equipment, including a 750-kw. turbo-generator with condenser equipment. The company recently filed notice of an increase in its capital stock from $50,000 to $100,000. C. C. Bosworth is manager and engineer.

GLEN LYN, W. VA.—The Appalachian Power Company, Bluefield, has plans under way for extensions to its plant at Glen Lyn, to provide for an increase in output from 20,000 kw. to 40,000 kw. New generating machinery, boilers and other equipment will be installed. Viele, Blackwell & Buck, 40 Wall Street, New York City, are consulting engineers.

KEARNEYSVILLE, W. VA.—The Northern Virginia Power Company, Winchester, Va., is considering extending its transmission lines to Middleway, near Kearneysville, W. Va.

MABEN, W. VA.—The Raleigh Wyoming Coal Company is considering the construction of a one-story power plant, 70 ft. x 80 ft., at its local properties. The Rust Engineering Company, 1901 Fifth Avenue, Pittsburgh, Pa., is engineer.

MARTINSVILLE, VA.—Plans have been prepared by the American Furniture Company for the construction of a new power house. Lockwood, Greene & Company, Charlotte, N. C., are architects.

WASHINGTON, D. C.—Bids will be received at the office of the Chief Signal Officer, U. S. Army, Washington, D. C., until Dec. 3, for furnishing 150 miles of cable, types WC 44 and WC 45. (Circular PR 8269-1CP.)

WASHINGTON, D. C.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids for furnishing the following: Until Dec. 13, Eastern and Western Yards, Schedule 9076—two testing panels; Mare Island, Schedule 9087—2,825 ft. lighting and power wire and 13,500 ft. lamp cord.

North Central States

GRAND RAPIDS, MICH.—Plans are under consideration by the Kent Storage Company, Front Street, N.W., for the construction of a power plant and cold storage plant. G. H. Hess is chief engineer.

LANSING, MICH.—The construction of a power house on the site of a projected State reform school, Lansing, to cost about $2,000,000, has been authorized by the Michigan State Administrative Board. Preliminary work, it is understood, is under way.

LUDINGTON, MICH. — The Stearns Lighting & Power Company is planning the erection of a new power unit, remodeling the unit now in use, and the installation of new equipment.

OTSEGO, MICH.—Bids, it is understood, will soon be received by the Mac Sim Bar Paper Company for the construction of a one-story electric power plant, 85 ft. x 140 ft., to cost, with machinery, about $300,000. Billingham & Cobb, Press Building, Kalamazoo, are architects and engineers.

SANDUSKY, MICH.—Arrangements are being made by the Council, it is reported, for the construction of a municipal electric light and power plant, to cost about $45,000. L. C. Reid is city engineer.

TECUMSEH, MICH.—The plant of the Dundee Electric Company has been purchased by Pliny Gratz and R. J. McCoy. The new owners are considering plans for the extension of transmission lines to Tecumseh for light and power purposes. Equipment, including a waterwheel, will be installed for generating electricity at the Quaker mill.

DAYTON, OHIO.—Plans are under consideration for improvements to the fire and police signal system, including the installation of new cables and boxes and the construction of a building to house switchboards. The cost is estimated at $200,000. F. E. Eichelberger is city manager.

FREMONT, OHIO. — The Ohio Power Company contemplates the construction of four transformer stations in Fremont, in addition to the two on which work is now under way.

DENVER, IND. — Arrangements have been made by the town committee for the installation of an electric lighting system. Electrical energy will be furnished by the Winona Interurban Railway Company with line connection at Chile, Ind.

HUNTINGTON, IND.—The Bippus Utilities Company, Huntington, has been organized by J. F. Bippus, owner of the Huntington Light & Fuel Company; J. A. and P. M. Browne, North Manchester, and others. The new company has taken over the electric plant at North Manchester and will control the transmission lines from this city to North Manchester, also furnish electricity in Goblesville and Bippus, as well as to residents along the lines.

NEW BOSTON, ILL.—The Illinois Northern Utilities Company, Dixon, is planning the erection of a high-tension transmission line to supply electricity in New Boston and vicinity.

SOLDIERS' GROVE, WIS.—Bids, it is reported, are being received by E. E. Dillon, consulting engineer, Washington Building, Madison, in behalf of the Atley Peterson estate, for equipment, including water wheel, generator, switchboard, etc., for the proposed hydro-electric power plant and dam, to cost $50,000. Clarence C. Peterson is general manager.

FT. MADISON, IOWA.—The City Council has organized a contract with the Fort Madison Electric Company for furnishing electricity for the proposed ornamental lighting system to be installed in the business section of the city.

BROOKINGS, S. D.—Plans have been completed by the State Board of Regents, Pierre, for the construction of a new power house at the State College of Agriculture and Mechanical Arts, Brookings. H. F. Berg, Pierre, is state engineer. T. W. Dwight is president of the board.

Southern States

CHARLOTTE, N. C.—Plans are under consideration by the Southern Power Company, Charlotte, for the construction of two hydro-electric plants on the Catawaba River, one to be located at Great Falls, where the company already has a plant, and the other at Mountain Island. The former will have a maximum capacity of 60,000 hp. and the latter 80,000 hp. Bids, it is reported, will be received by the Southern Power Company until Dec. 1 for excavation and masonry work on the proposed plants. The cost is estimated at more than $10,000,000. W. S. Lee, 511 Fifth Avenue, New York City, is vice-president and chief engineer.

ENFIELD, N. C.—Plans are being prepared for the construction of a municipal electric light and power plant in Enfield, to cost about $50,000. William C. Olsen, Kinston, is consulting engineer.

FORT SMITH, ARK.—Bids, it is reported, are being received by the Fort Smith Light & Power Company for new machinery to be installed at its power plant. It is proposed to increase the output by 7,000 hp. D. C. Green is manager.

MEXIA, TEX.—Preliminary surveys are being made by representatives of eastern capitalists for an interurban line from Waco to Mexia and Palestine. A site, it is understood, has been selected for a power plant.

Pacific and Mountain States

MARYSVILLE, CAL.—The Pacific Gas & Electric Company, Marysville, it is understood, is planning a survey with a view to furnishing electricity for lighting in Wheatland, Dobbins and Lomo Rica. E. C. Johnson is manager.

SAN JACINTO, CAL.—Arrangements are being made by the Lake Hemet Water Company, Hemet, for the construction of a hydro-electric power plant in the San Jacinto section, to cost about $100,000. W. S. Post, Central Building Los Angeles, is consulting engineer.

GREAT FALLS, MONT.—The Montana Power Company is planning the construction of a hydro-electric power plant and dam on the Missouri River, below Mystic Falls, to cost about $1,000,000. J. R. Hobbins is local manager.

Canada

BRODHAGEN, ONT.—The erection of a transmission line from Brodhagen to Dublin, to cost about $30,000, is under consideration. J. Jordan, Dublin, is interested.

LONDON, ONT.—The Utilities Commissioners contemplate the installation of an ornamental street-lighting system in London, to cost about $60,000. Inquiries, it is understood, are being made for prices on lamps, standards and general equipment. E. V. Buchanan, Hydro Building, is engineer.

STRATFORD TOWNSHIP, ONT — The Township Council is considering entering into an agreement with the Hydro-Electric Commission of Ontario for the erection of rural transmission lines.

DUNKIRK, SASK.—The Bisphoric Lent Company, Cincinnati, Ohio, has awarded general contract for the construction of a sulphate plant at Stink Lake, near Dunkirk, Sask., to S. Pritchard, 1120 Fourth Avenue, N.W., Moose Jaw, Sask. The plans provide for a power plant to be equipped with steam engines, boilers and generators, to cost about $100,000.